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PERMIT NO. 26-02

DATE ISSUED 2/11/81

STATE OF NORTH CAROLINA
DEPARTMENT OF HUMAN RESOURCES

Division of Health Services
P.O. Box 2091 Raleigh 27602

SOLID WASTE MANAGEMENT
PERMIT

THE DEPARTMENT OF THE ARMY

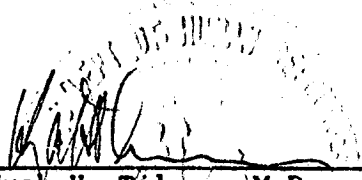
is hereby issued a permit to

operate a SANITARY LANDFILL


located on U.S. Federal Government Property on the Fort Bragg Military Reservation in Cumberland County, in accordance with Article 13B of the General Statutes of North Carolina and all rules promulgated thereunder. The facility is located on the below described property.

Being a tract of land owned by the United States Federal Government located in North Carolina, Cumberland County, on the Fort Bragg Military Reservation and to the North of Longstreet Road, said tract being described by the following coordinates based on the North Carolina Coordinate System.

Beginning at the Northeastern corner of said tract N 1,985,469.28, E 508,595.36; thence with the Eastern margin of said tract N 1,985,799.26, E 506,674.62, the Southeast corner; thence with the Southern margin of said tract N 1,983,640.70, E 505,971.55, the Southwest corner; thence with the Western margin of said tract N 1,983,309.59, E 508,190.98, the Northwest corner; thence with the Northern margin to the beginning coordinates, containing 106.81 acres more or less.



Hugh H. Tilson, M.D.
Director
Division of Health Services



O. W. Strickland, Head
Solid & Hazardous Waste Management
Branch
Environmental Health Section

AFZA-FE-E
North Carolina Department of Human Resources

If additional information is needed, please call Mr. J. B. Parker, Telephone:
(919) 396-8207.



JEROME B. HILMES
Colonel, CE
Director of Facilities Engineering

8 Incl
as

Copies Furnished:
Mr. Andrew Robinson
Division Health Services
Wachovia Bldg
Fayetteville, NC 28301



DEPARTMENT OF THE ARMY
HEADQUARTERS XVIII AIRBORNE CORPS AND FORT BRAGG
FORT BRAGG, NORTH CAROLINA. 28307



AFZA-FE-E

SUBJECT: Permit application for Solid Waste Disposal Facility (Identification Permit Number 26-02)

North Carolina Department of Human Resources
Division of Health Services
ATTN: Mr. J. Gordon Layton, Solid & Hazardous Waste Management Branch
Post Office Box 2091
Raleigh, North Carolina 27602

Reference your letter of 15 August 1980 regarding subject permit applications.

Inclosed herewith are the following plans:

- a. One (1) set, three (3) each, Dwg No. PE-01, Sanitary Landfill Boring Elevations.
- b. One (1) set, three (3) each, Dwg No. DFE-02, Soil Boring Locations and Plot Plan.
- c. One (1) set, three (3) each, Dwg No. DFE-03, Contour Map and Plot Plan, Sanitary Landfill.
- d. One (1) set, three (3) each, Dwg No. PE-04, Profile of Proposed Trench Sanitary Landfill.
- e. One (1) set, three (3) each, Dwg No. PE-05, Profile of Proposed Trench Sanitary Landfill.
- f. One (1) set, three (3) each, Dwg No. PE-06, Profile of Proposed Trench Sanitary Landfill.
- g. One (1) set, three (3) each, Dwg No. DFE-07, Settlement Basin Sanitary Landfill, Fort Bragg, NC.
- h. One (1) Dwg No. 18-02-02, Sanitary Landfill Location.

In addition to the pollution abatement measures described by the above cited drawings, leachate monitoring wells will be installed at locations to be recommended by your offices.

DESCRIPTION OF FORT BRAGG LANDFILL
BY THE NORTH CAROLINA COORDINATE SYSTEM

Being a tract of land owned by the United States Federal Government located in North Carolina, Cumberland County, on the Fort Bragg Military Reservation and to the North of Longstreet Road, said tract being described by the following coordinates based on the North Carolina Coordinate System.

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corner; thence with the Northern margin to the beginning coordinates,
containing 106.81 acres more or less.

ELDRIDGE R. BAREFOOT, JR.

Eldridge R. Barefoot, Jr. L-2495

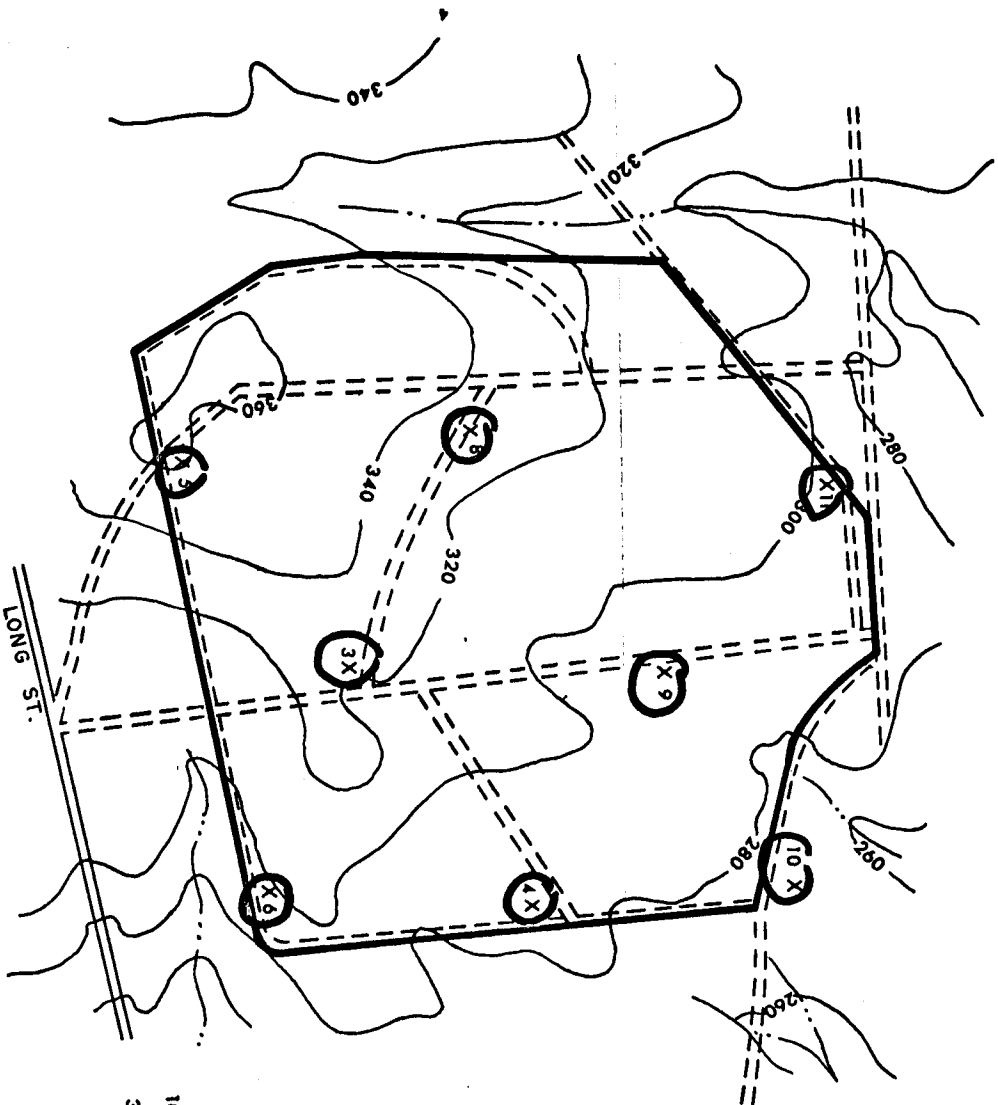


Incl 2

Coordinates for Fort Bragg Landfill

(N.C.C.S. from U.T.M.)

1. N/E Corner	X = 1,985,469.28 Y = 508,595.36
2. S/E Corner	X = 1,985,799.26 Y = 506,674.62
3. S/W Corner	X = 1,983,640.70 Y = 505,971.55
4. N/W Corner	X = 1,983,309.59 Y = 508,190.98



LEGEND:

- == PAVED ROAD
- - - UNIMPROVED DIRT ROAD
- X 5 BORE HOLE LOCATION NUMBER
- - - 360- CONTOUR WITH ELEVATION IN FEET
- - - STREAM DRAINAGE
- SITE BOUNDARY

SCALE:



NOTE: CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL



FIGURE 2. PROPOSED SANITARY LANDFILL SITE 2 FORT BRAGG, N.C.

c. Site 2. Discussion of this site is based upon the information gained from eight bore holes, 17 to 50 ft deep, and laboratory testing of 14 samples. Drilling logs are included in Appendix C. Laboratory testing results are shown in Table C-2.

(1) Site 2 is 0.2 miles north of Longstreet, 0.8 miles west of the junction of Longstreet and Gruber Roads. Longstreet provides good all weather access to the general site area; however, construction of all weather roads leading from Longstreet to the working area of the landfill is required. The site is about 0.8 miles from the nearest permanent buildings on the western edge of the main cantonment area.

(2) Site 2 is located on a sandhill with 100 ft of relief. The hill is bordered by stream drainages on four sides, giving a roughly rectangular-shape to the site. McPherson Creek on the south and east sides of the site is 900 ft laterally and 70 ft below the lower edge of the site. The wooded slopes are moderate; however, unvegetated areas have been eroded.

(3) Site 2 is underlain by the Tuscaloosa Formation. Two characteristics of this formation are important to landfill siting. First, this formation is used as a water supply with producing zones generally 100 to 300 ft deep. The DFAE Forestry Branch ranger station location to the west of Site 2 has a well yielding 15 gpm from the Tuscaloosa Formation, 108 to 126 ft below the ground surface. Second, movement of water through the formation is very slow due to the abundance of clay. The clay forms a series of thin discontinuous, almost horizontal beds. Water will move laterally to the edge of a bed, then drop down to the next bed. Thus, in a given period of time, the percolating water may move hundreds of feet laterally and only a few feet vertically. If the percolating water carries any pollutants, the long travel path ensures abundant contact time for natural degradation and removal of pollutants.

(4) The ground water encountered under Site 2 was perched water located atop discontinuous clay lenses. The perched water was found as shallow as 10 ft at Bore Hole 3 and as deep as 49 ft at Bore Hole 8. One week after augering, static water levels moved up as much as 3 ft in Bore Holes 3, 9 and 11, and down as much as 10 ft in Bore Hole 6. If the ground water had been part of a continuous confined aquifer, static water level changes should have been in the same direction. Also, if the aquifer was continuous over a large area, say 25 acres, or had a large storage capacity, one or two bore holes should not result in a significant change in static water level. The following table of water quality results also suggests perched water.



TABLE. SITE 2 WATER QUALITY AND WATER LEVEL DATA

Parameter	Bore Hole 3	Bore Hole 6	Bore Hole 9	Bore Hole 11
pH	8.3	7.1	5.8	5.8
Total Dissolved Solids, mg/l	104	81	11	6
Silica as SiO ₂ , mg/l	3.1	1.6	4.8	4.8
Static Level Change, ft	+2.5	-10.5	+3.0	+3.0
Water Table Elevation, ft†	313	274	280	282

† Datum is mean sea level.

Bore Holes 9 and 11 have similar water quality, water table elevation and rise in static water level. Water quality in Bore Holes 3 and 6 differ from each other and thus the water may be from different perched water tables. Water quality in Bore Holes 3 and 6 compared to the almost identical water quality of Bore Holes 9 and 11 is a definite indication of separate water bodies. Thus, it appears that the bore holes have penetrated two and possibly three separate perched water tables.

(5) The soil at Site 2 consists primarily of poorly graded sand-silt and sand-clay mixtures. Some sandy, silty or lean clays were found in each bore hole. With one exception, these lean clays supported a water table. Results listed in Table C-2 indicate the soil can be readily compacted; however, even good compaction will not significantly lower soil permeability. In the absence of clay, soil permeabilities of in-place and remolded samples ranged from 4×10^{-3} cm/s (4,100 ft/yr) to 4×10^{-6} cm/s (4.1 ft/yr) with a median value of 1×10^{-4} cm/s (104 ft/yr). The median permeability is too high to prevent water from percolating downward through the soil. When clay is present, permeabilities decrease to a range of 2×10^{-6} cm/s (2.1 ft/yr) to 5×10^{-9} cm/s (0.005 ft/yr). The clay forms a much better barrier to downward percolation of water. The maximum standard Proctor density ranged from 1.87 gm/cc (116.7 lb/ft³) to 1.99 gm/cc (124.2 lb/ft³). The cover material should be compacted to at least 105 lb/ft³. The abundance of sand and lack of clay make a good workable soil which maintains its trafficability in wet weather. The soil



can be easily excavated, spread and compacted for daily and final cover. However, the permeability of final cover should be reduced to minimize the entrance of water into the landfill. Clay from a borrow pit on Coolyconch Mountain or commercially-sold clay could be used to reduce the permeability of the final cover material.

(6) Site 2 has a sufficient span of use and size to warrant detailed plans for design, construction and operation of this new site. Title 40, CFR 241.203-1, requires that the plans be prepared or approved by a professional engineer. Site 2 has been put to use since completion of the field work for this report. Therefore, the plans for design, construction and operation of this site should address the unused area and the completion of the currently used portion of the site.

(7) A sanitary landfill should be developed in an orderly manner. The benefits from such development are many; the more important ones being efficient land use, conservation of energy and other resources, and maintenance of a pleasing site appearance. The following discussion should assist DFAE with the conceptual design of a sanitary landfill at Site 2.

(a) Based on the largest rectangular area which fits into Site 2, 115 of the 145 acres available would be used. Trenching on Site 2 is practical down to depths of 20 ft. With a trench width of 30 ft, two lifts of 10-ft thickness in the trench and compaction of the refuse to one-quarter its original volume, Site 2 would last about 20 years. The land use rate would then be 5.8 acres/year. If the excess soil excavated for the trenches was stockpiled for use in an area method landfill to be constructed over the completed trenches, an additional 45 years could be added to the life of the site. This could be accomplished in five lifts, each 10-ft thick, with about 20 percent of the excavated soil reserved to adjust for operational variations from the design plan. The use of the area method over the completed trenches will reduce land use to 1.8 acres/year.

(b) To dig 20-ft deep trenches, some perched water tables will have to be permanently drained. Since it is difficult to eliminate recharge to the perched water tables from rainfall, use of a bore hole(s) to lower the water table may be considered. The bore hole(s) would be used to provide a passage through the impermeable bed supporting the perched water table allowing the water to drop down to the next impermeable bed. This procedure shortens the downward path of percolating water by an insignificant amount if the bore holes are limited to the depth required for dropping the water table 3 to 5 ft below the trench bottom.

(c) Using the conceptual design in paragraph 5c(7)(a), the value of good compaction can be shown. If the waste is reduced to one-fifth of its original volume rather than one-fourth, then 4½ years are added to the use span of the trench method and 11 years to the use span of the area method;



thus a small increase in volume reduction increases site life from 65 years to 80 years. Special landfill compaction equipment is available and may be suitable for use at Ft Bragg, but a maximum compactive effort from whatever equipment used will pay dividends in terms of an extended landfill life.

(d) The design concept in paragraph 5c(7)(a) is an idealized solution suitable for flat terrain without drainage, soil or ground-water problems. Site 2 is located on a hillside, surrounded by intermittent drainages and has a variable ground-water table. Therefore, plans for design, construction and operation of the sanitary landfill should be tailored to the selected site. Site specific plans provide benefits by using all available land, minimizing haul distances for stockpiled cover material, integrating the site into the surrounding terrain, altering natural drainage of the site to promote runoff and minimize percolation through the landfill, and by minimizing the amount of land dedicated to sanitary landfills.

(8) In order to meet the requirement of 40 CFR 241.204-1, water quality monitoring is appropriate. The existence of perched water tables near the land surface and confined aquifers at depth limits the values of ground-water monitoring. Since most of the perched water eventually discharges to surface water and the surface water surrounding Site 2 is eventually used as a water supply, monitoring of surface water is appropriate for protection of health and environment. A more detailed discussion including sample points, monitoring parameters and analytical support is contained in Appendix E.

(9) Although Site 2 is the best location for a sanitary landfill at Ft Bragg, two precautions should be taken to protect life and health. First, every effort should be made to provide at least 6 inches of earth cover over all solid waste dumped on any day. The lack of earth cover will attract birds to the landfill site. Since the flight path of turbojet planes landing and taking off from Pope Air Force Base lies over Site 2, large bird populations at the sanitary landfill could pose a potential flight safety hazard due to bird strikes. However, proper daily covering of refuse in accordance with 40 CFR 241.209 and as described in paragraph 5, Appendix A, should minimize, if not eliminate, the potential flight safety hazard. Second, to minimize any chance of using contaminated ground water, water supply wells should be excluded from an area bounded by McKellar's Pond and McPherson Creek on the north, east and south sides of Site 2, and an intermittent tributary draining to McKellar's Pond on the west and northwest sides of Site 2.

6. CONCLUSIONS.

a. Site 2 is the best site currently available for location of a sanitary landfill.

b. The Tuscaloosa Formation will adequately protect adjacent, confined, low yield aquifers from leachate contamination.



c. Perched water tables are encountered at various depths under Site 2 and may require permanent lowering prior to the start of sanitary landfill trench operations.

d. The good, workable soil at Site 2 has a permeability too high to effectively prevent water from percolating downward through the landfill.

e. Detailed plans for design, construction and operation of Site 2 are required to most effectively use the land available.

f. Surface water monitoring is appropriate to protect health and environment.

g. Good sanitary landfill operation is required to minimize an increased bird strike risk to aircraft resulting from the attraction of large bird populations to the sanitary landfill.

7. RECOMMENDATIONS.

a. Use Site 2 as the next sanitary landfill location (para 5b). ✓

b. Drill holes through impermeable layers as one method of lowering perched water tables 3 to 5 ft below trench bottoms [para 5c(7)(b)]. ✓

c. Provide 6 inches of compacted clay in the final cover of active landfills to minimize water percolating through the landfill [para 5c(5)].

d. Exclude water supply wells from the area around Site 2, bounded by the tributaries to McKellar's Pond [para 5c(9)].

e. Operate the landfill in accordance with 40 CFR 241 and para 5, Appendix A [para 5c(9)].

f. Provide detailed plans for the design, construction and operation of the landfill. Ensure the plans are prepared or approved by a professional engineer [para 5c(6)].

g. Monitor the effluent of McKellar's Pond annually for the parameters listed in Table E-1 [para 5c(8)].

h. Monitor McPherson Creek and an unnamed tributary to McKellar's Pond quarterly for the parameters listed in Table E-2 [para 5c(8)].

i. Ensure all refuse is covered with 6 inches of compacted earth at the end of each operating day. The earth cover should be applied in a 2- to 3-inch layer, compacted, and then repeat the process until the total compacted thickness is 6 inches or more [para 5c(9)].

Landfill Site Selection Study No. 26-011-75/76, 27 May-18 Jun 75



8. TECHNICAL ADVICE AND ASSISTANCE.

a. Informal technical advice may be obtained by contacting Chief, Solid Waste Management Division, AUTOVON 584-2024.

b. Requests for services should be directed through appropriate channels to Commander, USA Health Services Command, ATTN: HSPA-H, Fort Sam Houston, TX 78234.

[Signature] NASMSC
LEWIS S. COONLEY, JR., P.E.
CPT, MSC
Sanitary Engineer
Solid Waste Management Division

APPROVED:

[Signature] NASMSC
to ROBERT G. GRODT, P.E.
LTC, MSC
Chief, Solid Waste Management Division

[Signature]
A. D. KNEESSY, P.E.
COL, MSC
Director, Environmental Quality



LANDFILL SITE SELECTION STUDY NO. 26-011-75/76
FORT BRAGG
FORT BRAGG, NORTH CAROLINA
27 MAY - 10 JUNE 1975



US ARMY
ENVIRONMENTAL HYGIENE AGENCY
ABERDEEN PROVING GROUND, MD 21010



SECTION I

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Solid Waste Management Rules, State of North
Carolina, Department of Human Resources, Division
of Health Services, Sanitary Engineering Section,
Recodified February 1, 1976.



SOLID WASTE MANAGEMENT RULES

Prepared by the Department of Human Resources
Division of Health Services
Sanitary Engineering Section

Recodified February 1, 1976

#411



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HUMAN RESOURCES - HEALTH; SANITARY ENGINEERING

10C .0100

SUBCHAPTER 10C - SOLID WASTE AND VECTOR CONTROL

SECTION .0100 - SOLID WASTE MANAGEMENT

.0101 DEFINITIONS

The following words and phrases shall have the meanings ascribed to them in this section and as ascribed by law:

- (1) "Garbage" means all putrescible wastes, including animal and vegetable matter, animal offal and carcasses, and recognizable industrial by-products, but excluding sewage and human wastes.
- (2) "Natural resources" means all materials which have useful physical or chemical properties which exist, unused, in nature.
- (3) "Recycling" means the process by which recovered resources are transformed into new products in such a manner that the original products lose their identity.
- (4) "Refuse" means all non-putrescible wastes.
- (5) "Resource recovery" means the process of obtaining material or energy resources from solid waste.
- (6) "Solid waste" means garbage, refuse, rubbish, trash, and other discarded solid materials, including solid waste materials resulting from industrial, commercial, and agricultural operations, and from community activities, but does not include solids or dissolved materials in domestic sewage or other significant pollutants in water resources, such as silt, dissolved or suspended solids in industrial waste water effluents, dissolved materials in irrigation return flows or other common water pollutants.
- (7) "Solid waste disposal" means the collection, storage, treatment, utilization, processing, or final disposal of solid waste.
- (8) "Solid waste disposal facility" means land, personnel, equipment, or other resources used in the disposal of solid wastes.
- (9) "Solid waste disposal site" means any place at which solid wastes are disposed of by incineration, sanitary landfill or any other methods.
- (10) "Solid waste management" means the purposeful, systematic control of the generation, storage, collection, transport, separation, processing, recycling, recovery and disposal of solid waste.
- (11) "Cell" means compacted solid waste completely enveloped by a compacted cover material.



- (12) "Division of health services" means the director or his authorized representative.
- (13) "Hazardous solid wastes" includes but is not limited to explosives, pathological wastes, pesticides, chemicals, and other toxic materials which are harmful to public health.
- (14) "Incineration" means the process of burning solid, semi-solid or gaseous combustible wastes to an inoffensive gas and a residue containing little or no combustible material.
- (15) "Local governing agency" refers to incorporated cities, counties, and special purpose districts which are empowered to undertake solid waste management programs.
- (16) "Open burning" means any fire wherein the products of combustion are emitted directly into the outdoor atmosphere and are not directed thereto through a stack or chimney, incinerator, or other similar devices.
- (17) "Open dump" means the consolidation of solid waste from one or more sources at a disposal site which has insanitary conditions, little or no cover, usually burning, and little or no management.
- (18) "Person" means any individual, firm, governmental unit, organization, partnership, corporation, or company.
- (19) "Putrescible" means solid waste capable of being decomposed by microorganisms with sufficient rapidity as to cause nuisances from odors and gases, such as kitchen wastes, offal and carcasses.
- (20) "Radioactive solid waste" means any radioactive material.
- (21) "Runoff" means the portion of precipitation that drains from an area as surface flow.
- (22) "Sanitary landfill" means a planned method of disposing of solid waste on land in a sanitary manner without creating nuisances or hazards to public health or safety by utilizing the principles of engineering to confine the solid waste to the smallest practical area, to reduce it to the smallest practical volume, and to cover it with a layer of compacted earth at the conclusion of each day's operation or at such more frequent intervals as may be necessary.
- (23) "Solid waste collector" means any person who collects or transports solid waste.
- (24) "Spoiled food" means any food which has been removed from sale by the United States Department of Agriculture, North Carolina Department of Agriculture, Food and Drug Administration, or any other regulatory agency having jurisdiction in judging food unfit for consumption.



HUMAN RESOURCES - HEALTH; SANITARY ENGINEERING

10C .0100

History Note: Statutory Authority G.S. 130-166.18;
Eff. February 1, 1976.

.0104 SOLID WASTE STORAGE

(a) The owner or occupant of any premise, business establishment, or industry shall be responsible for the sanitary storage of all solid waste accumulated at that premise, business establishment, or industry, except as exempt by statute.

(b) Garbage shall be stored in durable rust resistant, non-absorbent, water tight, rodent proof, and easily cleanable containers with a close fitting fly-tight cover and with adequate handles or bails to facilitate handling, or other types of containers acceptable to the local governing agency and conforming to the intent of this section.

(c) Refuse shall be stored in durable containers or as otherwise provided in this section. Where garbage is stored in combination with non-putrescible refuse, containers for the storage of the mixture shall meet the requirements for garbage containers.

(d) Hazardous solid waste, pending disposal, shall be stored in containers and at locations prescribed in the applicable state or federal rules and regulations for control of the specific hazardous material.

(e) All containers for the storage of solid waste shall be maintained in such a manner as to prevent the creation of a nuisance or insanitary conditions. Containers that are broken or otherwise fail to meet this rule shall be replaced with acceptable containers. Refuse too large or otherwise not suitable for storage in containers shall be stored in a nuisance free manner consistent with requirements with the local governing agency.

History Note: Statutory Authority G.S. 130-166.18;
Eff. February 1, 1976.

.0105 COLLECTION AND TRANSPORTATION OF SOLID WASTE

(a) The solid waste collector shall be responsible for the satisfactory collection and transportation of all solid waste to a disposal site or facility.

(b) Vehicles or containers used for the collection and transportation of garbage, or refuse containing garbage, shall be covered, leakproof, durable and of easily cleanable construction. These shall be cleaned as often as necessary to prevent a nuisance or insect breeding, and shall be maintained in good repair.

(c) Vehicles or containers used for the collection and transportation of any solid waste shall be loaded and moved in such a



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- (25) "Vector" means a carrier, usually an arthropod, that is capable of transmitting a pathogen from one organism to another.
- (26) "Water supply watershed" means an area from which water drains to a point or impoundment, and the water is then used as a source for a public water supply.
- (27) "Water table" means the upper limit of the portion of the ground wholly saturated with water.
- (28) "Working face" means that portion of the land disposal site where solid wastes are discharged, spread, and compacted prior to the placement of cover material.

History Note: Statutory Authority G.S. 130-166.18;
Eff. February 1, 1976.

.0102 APPLICABILITY

These solid waste disposal rules are for general application throughout the State of North Carolina unless otherwise specifically indicated by their context. The official policy and purpose of the State of North Carolina in regard to solid waste control is set forth in G.S. 130-166.16 through -166.21.

History Note: Statutory Authority G.S. 130-166.18;
Eff. February 1, 1976.

.0103 GENERAL CONDITIONS

(a) All solid waste shall be stored, collected, transported, separated, processed, recycled, recovered, and disposed of in a manner consistent with the requirements of these rules. The division of health services is responsible for the enforcement of these rules and encourages cooperation from individuals, municipalities, county governments, sanitary and regional districts, and private enterprise.

(b) Notwithstanding .0103(a) of this section, no radioactive solid wastes shall be collected and transported, stored, treated, processed, disposed of or reclaimed, except as specifically authorized by a radioactive material license issued by the division of facility services, Department of Human Resources.

(c) These rules shall not apply to the disposal of solid waste accumulated by an individual or individual family or household unit and disposed of on his own property. Authority for regulation of these wastes lies with boards of county commissioners, cities and towns, and local boards of health as specified by G.S. 153A-121 through -137, G.S. 153A-274 through -292, G.S. 160A-74 through -195, and G.S. 130-13 through -23.



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manner that the contents will not fall, leak or spill therefrom, and shall be covered when necessary to prevent blowing of material. If spillage should occur, the material shall be picked up immediately by the solid waste collector and returned to the vehicle or container and the area properly cleaned.

History Note: Statutory Authority G.S. 130-166.18;
Eff. February 1, 1976.

.0106 SOLID WASTE MANAGEMENT FACILITIES

All facilities used in the treatment and processing of solid waste for final disposal, or for utilization by reclaiming or recycling prior to final disposal, shall be operated in such a manner as to prevent the creation of a nuisance, insanitary condition, or potential public health hazard. Facilities used in sorting, separating, reducing, shredding, compressing, reclaiming, recycling, and other associate processes shall conform to these rules. The division of health services reserves the right to request submission of plans for approval to evaluate site location, design, operational techniques and procedures, and overall sanitation aspects of any facility used in the treatment, processing, or utilization of solid waste.

History Note: Statutory Authority G.S. 130-166.18;
Eff. February 1, 1976.

.0107 DISPOSAL OF SOLID WASTE

The disposal of solid waste shall be by the following approved methods or any combination thereof:

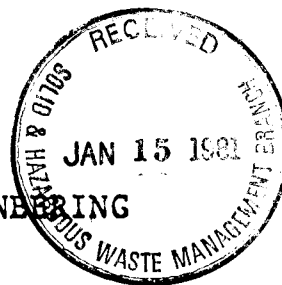
- (1) Sanitary landfill;
- (2) Approved incinerator; or,
- (3) Disposal by other sanitary methods which may be developed and demonstrated to be capable of fulfilling the basic requirements of these rules and which have been approved by the division of health services.

History Note: Statutory Authority G.S. 130-166.18;
Eff. February 1, 1976.

.0108 SITE AND PLAN APPROVAL

(a) No person shall establish a solid waste disposal facility or other facilities for solid waste management without first obtaining site and operational plan approval from the division of health services.

(b) Request for approval of site locations shall be submitted to the division of health services in writing. Approval by the division of health services shall be based on site appraisals,



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and such approval shall be obtained prior to submission of the operational plan for the facility. Approvals or denials of proposed site locations shall be made in writing by the division of health services.

(c) Each request for approval of sanitary landfill sites, operational plans, and other facilities for solid waste management shall be accompanied by the information and data required by .0111 and .0112 of this section and other applicable rules.

(d) Requests for approval of facilities and equipment for solid waste management and operations submitted by a private agency shall be accompanied by an approval letter from the local governmental agency having zoning authority over the area where the operations are to be located.

(e) Plans for the design, construction, and operation of new sites and new facilities or modifications to existing sites or facilities shall be prepared by a professional engineer or others having sufficient expertise to satisfy the requirements of these rules.

(f) Upon receipt of the request for approval, the division of health services shall review the request to assure that all provisions of these rules are met and that proposed facilities and operations will comply with other applicable state laws and rules. Based on its review, the division of health services shall either approve or deny the request in writing.

History Note: Statutory Authority G.S. 130-166.18;
Eff. February 1, 1976.

.0109 GENERAL CONDITION OF APPROVAL

Site approval for sanitary landfill sites shall be issued for areas only where the sanitary landfill rules can be maintained. Areas of special concern are those having high water tables, floodplains, and special stream and reservoir classifications.

History Note: Statutory Authority G.S. 130-166.18;
Eff. February 1, 1976.

.0110 DENIAL OR CANCELLATION OF APPROVAL

When a request for approval is denied or an approval is cancelled, the person shall be notified in writing of the reasons therefore. A denial or cancellation shall be without prejudice to the person's right to a hearing before the commission for health services or for filing a future request after revisions are made to meet objections specified as reasons for the denial or cancellation.

History Note: Statutory Authority G.S. 130-166.18;
Eff. February 1, 1976.

.0111 SANITARY LANDFILL SITE

For review and evaluation, the following information shall be presented in triplicate to the division of health services for each proposed sanitary landfill site:

(1) Map or aerial photograph of sufficient scale to provide the following:

- (1) Entire property owned or leased by the person proposing the sanitary landfill;
- (2) Land use and zoning within one-fourth mile of the disposal site;
- (3) Location of all homes, industrial buildings, public or private utilities, and roads; and,
- (4) Location of wells, watercourses, dry runs, rock outcroppings, and other applicable details regarding the general topography.

(2) Soil borings shall be made to provide sufficient information for an evaluation of subsurface conditions that exist at the site. The data shall include:

(1) Sufficient soil borings to provide geological data of the area planned for the proposed sanitary landfill. Soil borings shall be plotted relative to the boundaries of the proposed operational area.

* (2) The location of a bench mark that will not be destroyed during landfill development. From the bench mark, the ground elevation of each individual boring shall be determined and plotted.

(3) Soil borings that extend ten feet below the lowest proposed excavation and one boring at the lowest elevation of the planned operational area.

(4) A log of the soil borings in order that soil types and classifications can be determined and boring profiles plotted that will coincide with operational cross-sectional drawings as much as possible.

(5) Ground water elevations at the time of boring and 24 hours later along with other pertinent geological information.

-(6) When the cover material is to be obtained from sources other than the proposed disposal site, information from soil borings shall be provided, if necessary, showing the subsurface conditions of borrow areas.

(3) Soil classifications shall be made by the use of the Unified Soil Classification System, the U. S. Department of Agriculture Classification, or other available systems that provide an adequate soil description.



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- (4) Identify watercourses within or adjacent to the sanitary landfill areas and if no watercourse is involved, indicate the watershed by name which will receive the drainage from the site.
- (5) Any other information pertinent to the proposed site.

History Note: Statutory Authority G.S. 130-166.18;
Eff. February 1, 1976.

.0112 SANITARY LANDFILL OPERATIONAL PLANS

For review, evaluation, and approval three sets of the operational plans shall be submitted to the division of health services and shall include:

- (1) A plot plan of the proposed site showing dimensions, entrance and access roads.
- (2) The location of existing utilities and structures.
- (3) Contour maps of the original topography on a scale no greater than 200 feet per inch and five-foot contours.
- (4) Sufficient cross-sectional drawings or contour maps so that the proposed finished elevations of the filled area can be accurately determined. Cross-section drawings showing original elevations, the proposed excavation depths, and depths to the water table, if encountered.
- (5) The location of proposed utilities, on-site structures for equipment storage or employee usage, and weighing facilities, if planned.
- (6) The proposed method of landfilling, such as trenching, ramping and diking, or area filling.
- (7) Provisions for controlling of fill slopes on the outer face of peripheral dikes and face of the finished sanitary landfill.
- (8) Provisions for controlling erosion on all completed areas.
- (9) Procedures for promoting vegetative growth as soon as possible on all completed areas.
- (10) Sufficient buffer width along man-made or natural watercourses to confine visible siltation within the buffer zone.
- (11) Measures, structures, and devices designed and constructed so as to provide effective control for calculated peak rate of runoff from such storm frequency as indicated by the degree of protection needed in the design area.

History Note: Statutory Authority G.S. 130-166.18;
Eff. February 1, 1976.

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.0113 RECORDATION

A description of the landfill site that would be sufficient as a description in an instrument of conveyance shall be provided to initiate site recordation procedures described in G.S. 130-166.21.

History Note: Statutory Authority G.S. 130-166.21;
Eff. February 1, 1976.

.0114 REPORT

A report shall accompany the plans indicating the following:

- (1) Population and area expected to be served by the proposed site.
- (2) Anticipated type, quantity, and source of material to be disposed of at the site.
- (3) Type and number of pieces of equipment to be provided at the site for excavating, earth moving, spreading, compacting, covering, and other needs.
- (4) Name of individual responsible for operation and maintenance of the site.
- (5) Projected use of land after completion of the sanitary landfill.
- (6) Anticipated lifetime of project.
- (7) Any other information pertinent to the proposed operational plan.

History Note: Statutory Authority G.S. 130-166.18;
Eff. February 1, 1976.

.0115 SITE ACCEPTANCE CONDITIONS

Prior to receiving solid waste on any new site, the following requirements shall be met:

- (1) Recordation of the order of approval.
- (2) Site preparation shall be complete and an inspection shall be made by a representative of the division of health services for final approval prior to the facility becoming operational.

History Note: Statutory Authority G.S. 130-166.18;
Eff. February 1, 1976.

.0116 OPERATIONAL REQUIREMENTS FOR SANITARY LANDFILLS

Any person who maintains or operates a sanitary landfill site shall maintain and operate the site in conformance with the following practices unless otherwise allowed by the division of health services in granting the required approval:

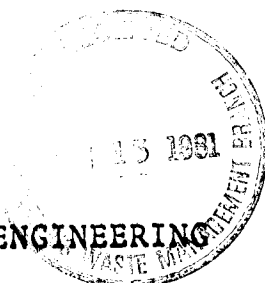
- (1) Operational plans shall be approved and followed.



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- (2) Solid waste shall be restricted to the smallest area feasible, compacted as densely as practical into cells, and a proper slope on the working face shall be maintained.
- (3) Solid waste shall be covered after each day of operation, or as specified by the division of health services, with a compacted layer of at least six inches of suitable cover.
- (4) Within one month after final termination of disposal operations at the site or a major part thereof, the area shall be covered with at least two feet of compacted earth adequately sloped to allow surface water runoff in a controlled manner without excessive erosion.
- (5) The finished surface of the filled area shall be covered with adequate topsoil and seeded with native grasses or other suitable vegetation immediately upon completion or as soon as practical. If necessary, seeded slopes shall be covered with straw or similar material to prevent erosion.
- (6) Adequate erosion control measures shall be practiced.
- (7) An attendant shall be on duty at the site at all times while it is open for public use.
- (8) The approach road to the site shall be of all-weather construction and maintained in good condition.
- (9) Dust control measures should be implemented where necessary.
- (10) Surface water shall be diverted from the operational area.
- (11) Disposal of solid waste in water is prohibited.
- (12) Open burning of solid waste is prohibited.
- (13) Equipment shall be provided to control accidental fires or arrangements made with the local fire protection agency to immediately provide fire-fighting services when needed.
- (14) Spoiled foods, animal carcasses, abattoir waste, hatchery waste, and other animal waste delivered to the disposal site shall be compacted and covered immediately and separately from the routine solid waste.
- (15) No hazardous wastes shall be disposed of in a sanitary landfill except as may be permitted by the division of health services.
- (16) Effective vector control measures shall be applied to control flies, rodents, and other insects or vermin when necessary.
- (17) Appropriate methods such as fencing and diking shall be provided to confine possible windblown material within the area. At the conclusion of each day of operation, all windblown material resulting from the operation shall be



collected and returned to the area by the owner or operator.

- (18) Signs providing information on dumping procedures and indicating the hours during which the site is open for public use, and other pertinent information shall be posted at the site entrance.
- (19) Traffic signs or markers shall be provided as necessary to promote an orderly traffic pattern to and from the discharge area and to maintain efficient operating conditions.
- (20) Prior to termination of operations at a sanitary landfill site the division of health services shall be notified in order that a site inspection may be made by the division of health services to determine compliance with closing procedures before earth moving equipment is removed from the property.
- (21) Once a solid waste disposal site has been closed in accordance with the requirements of the division of health services, future necessary maintenance shall be the responsibility of the owner.

History Note: Statutory Authority G.S. 130-166.18;
Eff. February 1, 1976.

.0117 INCINERATOR OPERATION

(a) All incinerators shall be designed and operated in a manner so as to prevent the creation of a nuisance or potential health hazard and must comply with the applicable requirements of these rules and those of the division of environmental management, Department of Natural and Economic Resources.

(b) Construction of an incinerator shall not be initiated prior to the approval of site plans by the division of health services. Such plans must be accompanied by a written approval of the incinerator from the division of environmental management and by a written statement from the governmental agency having zoning authority that the proposed incinerator site has been approved.

(c) Each proposed incinerator installation shall be in compliance with the following criteria:

- (1) The incinerator plant shall be so situated, equipped, operated, and maintained as to minimize interference with other activities in the area.
- (2) All solid waste to be disposed of at the site shall be confined to the dumping area. Adequate storage facilities shall be provided.
- (3) Effective vector control measures shall be applied to control flies, rodents, and other insects or vermin.

- (4) Equipment shall be provided in the storage and charging areas and elsewhere as needed or as may be required in order to maintain the plant in a sanitary condition.
- (5) All residue from the incinerator plant shall be promptly disposed of at an approved site and in a manner consistent with the applicable sections of these rules.
- (6) Upon completion of construction of the incinerator facility and prior to initial operation, the division of health services shall be notified in order that an inspection may be made of the facility to determine conformance with the approved plan and with the applicable provisions of these rules.

History Note: Statutory Authority G.S. 130-166.18;
Eff. February 1, 1976.

.0118 VARIANCES

(a) In order to avoid undue hardships, promote the effective and reasonable application and enforcement of these rules, the division of health services may grant variances from the requirements of these rules in accordance with such procedures and conditions as it may prescribe. Each application for variance shall be examined on the basis of conditions prohibiting full compliance.

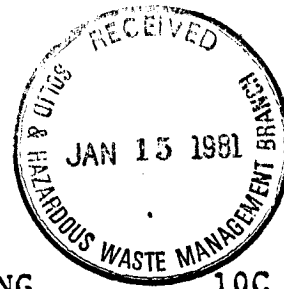
(b) Variable factors such as population density, daily or seasonal loadings, nature of wastes, location of facility or facilities, water table conditions, topography, soil and geology, climate, land use, stream reservoir classification are to be taken into account in determining the degree of variance, if any, which may be allowed.

History Note: Statutory Authority G.S. 130-166.18;
Eff. February 1, 1976.

.0119 LIMITATIONS

Nothing in these rules shall be construed to limit the authority of municipal and county governments or sanitary districts from adopting more stringent solid waste disposal requirements than those set forth in these rules.

History Note: Statutory Authority G.S. 130-17;
Eff. February 1, 1976.



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.0120 SEVERABILITY

If any provision of these rules or its application to any person or circumstances is held invalid, such invalidity shall not affect other provisions or applications of the rules which can be given effect without the invalid provisions or applications, and to this end the provisions of these rules are declared to be severable.

History Note: Statutory Authority G.S. 130-166.18;
Eff. February 1, 1976.

.0121 PENALTIES, INJUNCTIONS

If any person shall violate any rules adopted by the Commission for Health Services, he shall be guilty of a misdemeanor and punishable by a fine not to exceed fifty dollars (\$50.00) or by imprisonment not to exceed thirty (30) days, as provided by G.S. 130-203. G.S. 130-205 further provides for injunctive relief against such continued violation, threatened violation, hindrance, or interference.

History Note: Statutory Authority G.S. 130-203; 130-205;
Eff. February 1, 1976.

.0122 REFERENCE RULE

The Commission for Health Services adopts by reference the United States Department of Agriculture Textural Classification Chart which can be found in "Sanitary Landfill Design and Operation", EPA publication (SW-65ts) for sale by the Superintendent of Documents, United States Printing Office, Washington, D.C. at a charge of \$.65.

History Note: Statutory Authority G.S. 130-166.18;
Eff. February 1, 1976.

.0123 NONCONFORMING SITES AND FACILITIES

A person operating or having operated an open dump for disposal of solid waste shall immediately convert to a sanitary landfill or close the site in accordance with the following requirements:

- (1) Implement effective rat control, including baiting for at least two weeks after closing, to prevent rat migration to adjacent properties.
- (2) Compact and cover existing solid waste. Final cover for the entire area shall be two feet or more of compacted earth.
- (3) Implement erosion control measures by grading and seeding.
- (4) Post signs indicating the dump site closure.

History Note: Statutory Authority G.S. 130-166.18;
Eff. April 23, 1976.



SECTION II

CONTENTS

<u>SHEET NO.</u>	<u>TITLE</u>
1	Data specified in Section .0111 of Solid Waste Management Rules
2	Map of Fort Bragg, Drawing No. 18-02-02
3	Copy of Landfill Site Selection Study as prepared by US Army Environmental Hygiene Agency
4	Soil Boring Profile Sheet No. PE-01



SHEET NO. 1

.0111 SANITARY LANDFILL SITE:

1. A map of Fort Bragg (Drawing No. 18-02-02) is included as part of this submission. All land is owned by the US Government, and all land use within one quarter mile of the deposit site is forest land. There are no homes, residences, industrial buildings, public or private utilities within one quarter mile of the disposal site. Longstreet Road, a two lane 24 foot wide asphalt paved road in an east-west orientation, is located approximately 600 feet south of the disposal site and provides vehicular access to the landfill site. There is one known water well in the immediate vicinity of the site, and the only water course includes McPherson Creek on the east and south sides of the site. The well, watercourse, and geological data are discussed in the Landfill Site Selection Study as prepared by the US Army Environmental Hygiene Agency. A copy of the study is included as part of this submission.

2. Soil borings were taken during the site selection study. Boring data and soil classifications are contained in the Site Selection Study. Borings have been plotted on Profile Sheet No. PE-01 included in this submission.



DEPARTMENT OF THE ARMY CPT Coonley/smt/584-2024
U. S. ARMY ENVIRONMENTAL HYGIENE AGENCY
ABERDEEN PROVING GROUND, MARYLAND 21010

HSE-ES

27 JUL 1976

SUBJECT: Landfill Site Selection Study No. 26-011-75/76, Fort Bragg, North Carolina, 27 May - 10 June 1975

THRU: Commander
USA Forces Command
Attn: AFEN-FEU
Ft McPherson, GA 30330

TO: Commander
Fort Bragg
Fort Bragg, NC 28307

Attached are eight copies of subject report.

FOR THE COMMANDER:

1 Incl
as (8/7 cy)

CF: w incl
HQDA (DASG-HCH)
HQDA (DAEN-FEU)
HQDA (DAEN-ZCE)
Cdr, HSC (HSPA-H)
Cdr, MEDDAC, Ft Bragg
Supt, AHS (HSA-RHE)
Cdr, FORSCOM (AFMD)
C, USAEHA Regional Division - South

A. D. KNEESSY

A. D. KNEESSY, P.E.
COL, MSC
Director, Environmental Quality





SECTION III

CONTENTS

<u>SHEET NO.</u>	<u>TITLE</u>
5	Data specified in Section .0112 of Solid Waste Management Rules
6	Plot Plan, Sanitary Landfill, Drawing No. DFE-02.
7	Contour Map, Drawing No. DFE-03.
8	Trench Profiles and Cross Sections, Drawing Nos. PE-04, PE-05, and PE-06.



HSE-ES/WP

DEPARTMENT OF THE ARMY
U. S. ARMY ENVIRONMENTAL HYGIENE AGENCY
ABERDEEN PROVING GROUND, MARYLAND 21010



LANDFILL SITE SELECTION STUDY NO. 26-011-75/76
FORT BRAGG
FORT BRAGG, NORTH CAROLINA
27 MAY - 10 JUNE 1975

1. AUTHORITY.

- a. AR 40-5, Health and Environment, 25 September 1974.
- b. Letter, HSE-X, this Agency, 29 November 1974, subject: Revised Mission Services, Third Quarter, FY 75.

2. REFERENCES. See Appendix A for listing of references.

3. PURPOSE. The purpose of this study was to locate sanitary landfill sites for immediate and future needs.

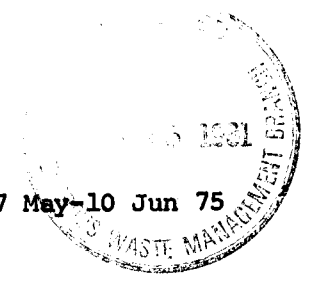
4. GENERAL.

a. Abbreviations and Definitions. A glossary of abbreviations and terms used in this report is included in Appendix B.

b. Personnel Contacted.

- (1) DFAE.
 - (a) COL J. O. Baker, CE, Director.
 - (b) MAJ J. D. MacMullen, CE, Chief, Environmental Protection Branch.
 - (c) Mr. W. C. Beard, Chief, Buildings and Grounds Division.
 - (d) Mr. B. W. Anderson, Jr., Chief, Sanitation Branch, Utilities and Pollution Control Division.
 - (e) Mr. T. J. Barnes, Civil Engineer, Buildings and Grounds Division.
 - (f) Mr. K. L. Harris, Land and Wildlife Management Branch.
- (2) MEDDAC - Ft Bragg.
 - (a) COL L. B. Edelman, MC, Chief, HEV Activity.





(b) MAJ W. M. Newberry, MSC, Environmental Science Officer.

(c) CPT J. Kardatski, MSC, Entomologist.

c. Basis for Report. The findings, conclusions and recommendations contained in this report are based upon observations, field data and laboratory analyses of 32 samples taken from 16 bore holes to determine Atterberg limits, grain size, compaction, permeability, moisture content and density. The results of laboratory analyses are summarized in Tables C-1 through C-4 and drilling logs are provided in Appendix C.

d. General Setting. The Ft Bragg cantonment area lies in the Sandhills physiographic subprovince, Cumberland County, NC. The Cretaceous or younger age sediments of the subprovince are characterized by rounded hills and loose to fairly well-consolidated sand.* A dendritic drainage pattern is predominant. The geologic section at Ft Bragg includes surficial sands underlain by the Cretaceous Tuscaloosa Formation which consists of loose sand at surface exposures, lying over fairly well-consolidated sandy clay. Deeper beds in the formation are predominantly clay intimately mixed with 5 to 25 percent silt and sand. These deeper clay beds are occasionally used for water supplies; however, yields are generally less than 15 gpm. Several ranger station wells at Ft Bragg draw water from the Cretaceous clay aquifer. The bore hole logs indicated all proposed landfill sites are located in surficial sands. In only a few instances was it likely the bore holes penetrated the upper portion of the Tuscaloosa Formation.

5. FINDINGS AND DISCUSSION.

a. Waste Generation. Ft Bragg presently generates an estimated 43,000 cubic yards/month of uncompacted municipal-type refuse. This value was determined using a generation rate of 4.0 pounds per person per day, 125 pounds per cubic yard uncompacted refuse density and an equivalent population of 45,100. Two weeks of solid waste weighing performed for a study described in paragraph 7, Appendix A, determined a generation rate of 135 tons/operating day.

b. Potential Sites. Soil and ground-water conditions were investigated at four sites shown on Figure 1. Study has shown the 145-acre Site 2 (Figure 2) as the best location for a sanitary landfill. Site 2 will be discussed in detail in the following paragraphs. Discussion of Sites 1, 3 and 4 are included in Appendix D.

* Geology and Ground-Water Resources of Fayetteville Area, Ground Water Bulletin No. 3, North Carolina Division of Water Resources, (1961)

LEGEND: (A) MONITORING POINT

SCALE:

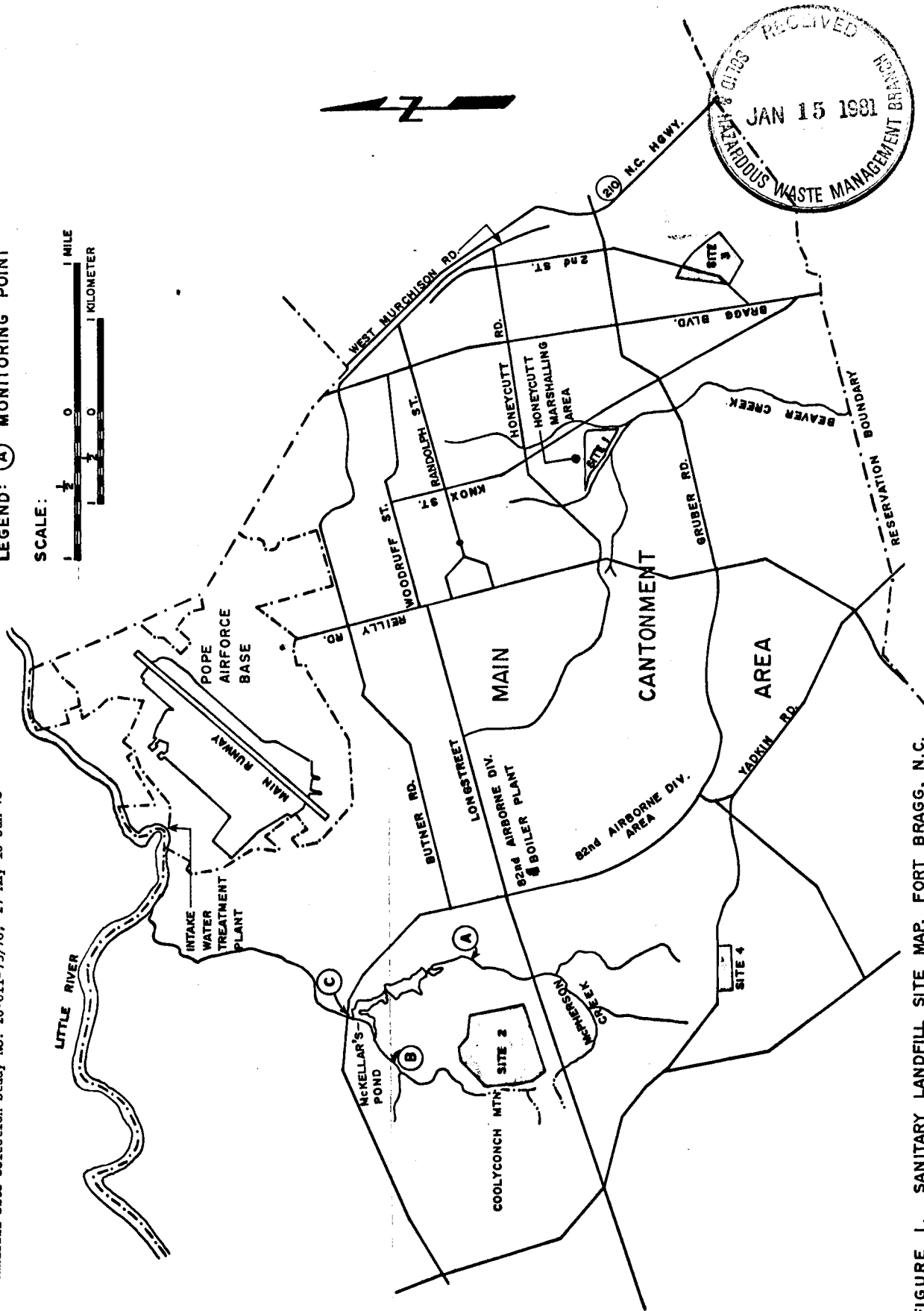


FIGURE 1. SANITARY LANDFILL SITE MAP, FORT BRAGG, N.C.



SECTION VI

CONTENTS

Data as specified in Section .0016 of Solid Waste Management Rules.

.0116 OPERATIONAL REQUIREMENTS.

1. Solid waste is deposited into trenches from the upper or filled end of the trench. The waste is pushed into the trench and compacted into a cell block with the landfill compactor. The cell is completely covered at the end of each day with at least 6 inches of compacted earth.

2. Finished surfaces are continuously maintained to prevent erosion and to control surface runoff.

3. The landfill is attended by engineering equipment operators at all times it is open for use. The landfill is open only to Fort Bragg personnel engaged in refuse collection and disposal, Fort Bragg shop personnel, contractors engaged in refuse collection and disposal on Fort Bragg, troop units, Pope Air Force Base, construction contractors, and PX concessions and vendors. Operational hours are Monday through Friday, 0730-1600, and Saturday, 0730-1230.

4. The access road to the site is a double surface bituminous treated road. Roads within the site are compacted sand-clay and are maintained in excellent condition.

5. CO₂ fire extinguishers are on site to assist in combating fires. The landfill compactor is equipped with mobile radio to provide continuous communications with other Facilities Engineer activities and is used to summon assistance from Fort Bragg Fire Department as necessary. Open fires are prohibited.

6. Spoiled foods, animal carcasses, and/or other animal wastes are buried and covered separately from the routine solid wastes.

7. ~~Hazardous wastes or items of questionable nature are coordinated with Fort Bragg medical authorities prior to disposition.~~ *Rewritten See next page.*

8. Vector control measures are applied as required.

9. Temporary fencing is utilized as necessary to prevent excessive littering.

10. Information signs are constructed in appropriate locations to convey information necessary to the users of the landfill.



SANITARY LANDFILL

FT BRAGG, NC

THIS PACKAGE CONTAINS DOCUMENTATION REQUIRED FOR
NORTH CAROLINA STATE APPROVAL OF THE SANITARY
LANDFILL AT FORT BRAGG, NC.

Commander

XVIII Airborne Corps & Fort Bragg

attn: AFZA-FE-EE

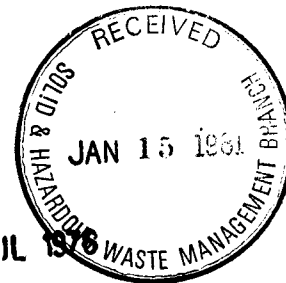
Fort Bragg, NC 28307

[Signature]



HSE-ES/WP

DEPARTMENT OF THE ARMY
U. S. ARMY ENVIRONMENTAL HYGIENE AGENCY
ABERDEEN PROVING GROUND, MARYLAND 21010



LANDFILL SITE SELECTION STUDY NO. 26-011-75776
FORT BRAGG
FORT BRAGG, NORTH CAROLINA
27 MAY - 10 JUNE 1975

ABSTRACT

The purpose of this study was to locate sanitary landfill sites for immediate and future use. Much of the available land at Fort Bragg is unsuitable because of the abundance of highly permeable sand and proximity to ground water and surface streams. One site, about 145 acres, was found to be the best available. With proper design and operation, the site could last in excess of 50 years. Three other sites studied required varying degrees of site improvement prior to use. Clay or clayey soil is needed in the final cover material of the best available site to lower soil permeability. Monitoring of stream water quality is suggested since the perched water under the best available site discharges to surface water upstream of the Fort Bragg Water Treatment Plant intake.



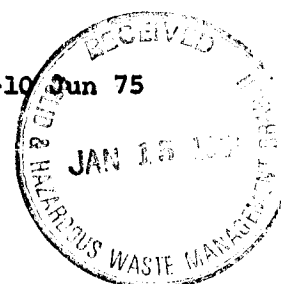
Landfill Site Selection Study No. 26-011-75/76, 27 May 75



APPENDIX A

REFERENCES

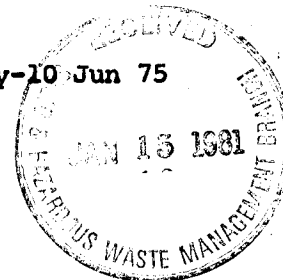
1. AR 200-1, Environmental Protection and Enhancement, 7 December 1973.
2. AR 420-47, Refuse Collection and Disposal, 18 September 1967.
3. TM 5-814-5, Sanitary Landfill, 15 October 1973.
4. Title 40, Code of Federal Regulations, 1975 ed., Part 241, Guidelines for the Land Disposal of Solid Wastes.
5. Sanitary Landfill Design and Operation, US Environmental Protection Agency (EPA), available from the Superintendent of Documents, US Government Printing Office, Washington, DC 20402, Stock No. 5502-0085, price \$0.65.
6. Letter, AFZAFE-B, HQ, XVIII Airborne Corps and Fort Bragg, 26 November 1974, subject: Sanitary Fill Location, with indorsement.
7. Letter, CERL-ESE, USA Construction Engineering Research Laboratory, 16 April 1975, subject: Preliminary Findings: Energy-Recovery Solid Waste Utilization at Fort Bragg, NC.



APPENDIX B

ABBREVIATIONS AND DEFINITIONS

Area Method	The practice by which waste is spread and compacted on the natural surface of the ground and cover material is spread and compacted over the refuse
Atterberg Limits	The moisture contents which define the soil boundaries between liquid and plastic state, the plastic semi-solid state, and the semi-solid and solid state
CE	Corps of Engineers
cm/s	centimeters per second
Compaction Test	A laboratory test which will yield a degree of soil compaction comparable to that obtained by field methods (compactive energy = 12,400 ft-lb/ft ³)
Cover Material	Earth that is used to cover compacted solid wastes in a sanitary landfill
Cretaceous	A period following the Jurassic and preceding the Tertiary, about 135 to 180 million years ago
DFAE	Directorate of Facilities Engineering
Endrin	1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4-endo, endo-5,8-dimethanonaphthalene
EPA	Environmental Protection Agency
Final Cover	A minimum of 2 feet of compacted earth material placed over completed sections of a sanitary landfill
ft/yr	Feet per year
gm/cc	Grams per cubic centimeter
gpm	Gallons per minute
Grain Size Analysis	A test to determine the size of mineral particles that make up a rock or sediment
Ground Water	Loosely, all subsurface waters excluding waters in the deep interior of the earth



HEV	Health and Environment
lb/ft ³	Pounds per cubic foot
Leachate	Liquid emanating from a land disposal cell that contains dissolved, suspended and/or microbial contaminants from the solid waste
Lindane	1,2,3,4,5,6-hexachlorocyclohexane, gamma isomer
MEDDAC	Medical Department Activity
Methoxychlor	1,1,1-Trichloro-2,2-bis [p-methoxyphenyl] ethane
mg/l	Milligrams per liter
Permeability	The capacity of a porous medium to conduct or transmit fluids.
Solid Waste	All refuse materials other than gaseous and liquid wastes
Sanitary Landfill	A land disposal site employing an engineered method of disposing solid wastes on land in a manner that minimizes environmental hazards by spreading the solid wastes in thin layers, compacting the solid wastes to the smallest practice volume, and applying cover material at the end of each operating day
Toxaphene	C ₁₀ H ₁₀ Cl ₈ - Technical chlorinated camphene, 67-69 percent chlorine
Trench Method	Practice of landfilling in which waste is spread, compacted and covered in an excavated trench
Water Table	The surface of a body of unconfined ground water at which the pressure is equal to that of the atmosphere, except where that surface is formed by an impermeable body
2,4-D	2,4-Dichlorophenoxyacetic acid
2,4,5-TP Silvex	2-(2,4,5-Trichlorophenoxy)propionic acid



APPENDIX C

SUMMARY OF LABORATORY ANALYSES AND DRILLING LOGS

Abbreviations Used in the Table and Drilling Logs

CL	Inorganic clays of low to medium plasticity, sandy clays, silty clays, "Unified Soil Classification"
MH	Inorganic silts, micaceous fine sandy or silty soils, elastic silts, "Unified Soil Classification"
ML	Inorganic silts and very fine sands, silty or clayey fine sands with slight plasticity, "Unified Soil Classification"
SC	Clayey sands, poorly graded sand-clay mixtures, "Unified Soil Classification"
SM	Silty sands, poorly graded sand-silt mixtures, "Unified Soil Classification"
SP	Poorly graded sands, little or no fines, "Unified Soil Classification"
SW	Well graded sands, little or no fines, "Unified Soil Classification"
LL	Liquid Limit, percent of dry weight
PL	Plastic Limit, percent of dry weight
PI	Plasticity Index, percent of dry weight
NP	Nonplastic
e	Void Ratio - ratio of void volume to solid volume in a soil mass
K	Coefficient of permeability measured on an undisturbed sample cm/s
K_e	Coefficient of permeability at a given void ratio measured on a disturbed sample hand packed in permeameter, cm/s
K_r	Coefficient of permeability at a given density measured on a sample remolded from the standard Proctor compaction test, cm/s
d_m	Maximum standard Proctor density, pcf
d_r	Density of remolded sample tested for permeability, lb/ft ³
w_c	Optimum moisture for standard Proctor compaction, percent of dry weight
D	In place density, lb/ft ³
m	In place moisture, percent of dry weight lb/ft ³ Pounds per cubic foot
BS	Bag sample
SS	Split spoon sample
ST	Shelby tube sample
(T)	Top of Shelby tube sample
(B)	Bottom of Shelby tube sample
E	1,987,420 - East grid coordinate based on North Carolina State Plane Coordinate System, North Zone, as used on Fort Bragg DFAE maps
N	508,420 - North grid coordinate based on North Carolina State Plane Coordinate System, North Zone, as used on Fort Bragg DFAE maps

Landfill Site Selection Study No. 26-011-75/76, 27 May-10 Jun 75

TABLE C-1. SUMMARY OF LABORATORY ANALYSES, SITE 1

Bore Hole	Depth ft	Sample Type	Liquid Limit %	Plastic Limit %	Plasticity Index %	Unified Soil Classification	Permeability Void Ratio e	Undisturbed Permeability K_e cm/s	Disturbed Permeability K_e cm/s	In Place Density pcf	In Place Moisture %
7	14-3	SS	--	--	--	SP	--	--	--	99.2	8.8
7	94-11	SS	22	20	2	SW-SM	--	--	--	--	11.2
7	134-15	ST	--	--	--	SW-SM	0.57	--	6×10^{-3}	114.8	9.0
12	2-34	ST	27	24	3	SM	0.85	3×10^{-7}	--	114.2	36.5
12	104-12	ST	30	18	12	SW-SC	0.54	1×10^{-4}	--	110.4	13.2
13	24-4	ST	15	12	3	SM	0.67	2×10^{-4}	--	104.2	4.0
14	74-9 (T)	ST	41	26	15	ML	0.71	6×10^{-8}	--	104.8	21.3
14	74-9 (B)	ST	17	15	2	SM	--	--	--	112.3	15.9
14	18-194	ST	--	NP	--	SM	0.53	--	3×10^{-4}	91.7	20.4

-- Not determined



Landfill Site Selection Study No. 26-011-75/76, 27 May-10 Jun 75

TABLE C-2. SUMMARY OF LABORATORY ANALYSES, SITE 2

Bore Hole	Depth ft	Sample Type	Liquid Limit %	Plasticity Index %	Unified Soil Classification	Permeability Ratio e	Undisturbed Permeability K cm/s	Disturbed Permeability K _o cm/s	Remolded Permeability at Given Density K cm/s	Remolded Permeability Density lb/ft ³	Maximum Standard Proctor Density	Optimum Moisture Content lb/ft ³	In Place Density pcf	In Place Moisture %
3	17 1/2-18 1/2	ST	36	22	14	0.40	1x10 ⁻⁸	--	--	--	--	--	124.8	14.0
4	1-4	BS	†	†	--	--	--	--	--	--	--	--	--	--
4	9 1/2-10 1/2	ST	--	--	--	0.68	--	2x10 ⁻⁴	--	--	--	--	99.2	18.0
4	18 1/2-20	ST	27	26	1	0.54	5x10 ⁻⁹	--	--	--	--	--	105.5	18.0
5	3-7	BS	--	--	--	0.36	--	--	4x10 ⁻⁶	122.9	124.2	10.5	--	--
5	18-21 1/2	BS	--	NP	--	0.39	--	--	2x10 ⁻⁴	121.1	122.9	10.0	--	--
5	25 1/2-27	ST	--	--	--	0.73	4x10 ⁻³	--	--	--	--	--	--	--
6	5 1/2-6 1/2	ST	18	10	8	--	--	--	--	--	--	--	106.0	20.0
6	13 1/2-15	ST	--	NP	--	0.55	1x10 ⁻⁵	--	--	--	--	--	116.1	11.7
8	8-9	ST	--	NP	--	0.49	--	1x10 ⁻⁴	--	--	--	--	111.7	12.9
9	5 1/2-7	SS	26	16	10	0.54	2x10 ⁻⁶	--	--	--	--	--	108.0	9.7
10	8-10	BS	†	†	--	0.53	--	5x10 ⁻⁵	--	--	116.7	13.7	91.7	15.6
10	12-14	BS	18	16	2	--	--	--	--	--	--	--	--	--
11	4-5	ST	28	17	11	--	--	--	--	--	--	--	118.6	13.9

-- Not determined

† Not reported

Landfill Site Selection Study No. 26-011-75/76, 27 May-10 Jun 75

TABLE C-3. SUMMARY OF LABORATORY ANALYSES, SITE 3

Bore Hole	Depth ft	Sample Type	Liquid Limit %	Plastic Limit %	Plasticity Index %	Unified Soil Classification	Permeability Void Ratio	Disturbed Density Permeability K_g cm/s	In Place Density lb/ft ³	In Place Moisture %
1	5 1/2-7	ST	--	--	--	SPT	--	--	69.9	3.1
1	17 1/2-19	ST	--	--	--	SPT	0.60	1×10^{-3}	99.8	12.8

-- Not determined

† Unified soil classification based on sieve analysis only



Landfill Site Selection Study No. 26-011-75/76, 27 May-10 Jun 75

TABLE C-4. SUMMARY OF LABORATORY ANALYSES, SITE 4

Bore Hole	Depth ft	Sample Type	Liquid Limit %	Plastic Limit %	Plasticity Index %	Unified Soil Classification	Permeability Ratio e	Undisturbed Permeability K cm/s	Disturbed Permeability K_e cm/s	Remolded Permeability at Given Density K_r cm/s	Remolded Permeability Density lb/ft ³	Maximum Standard Proctor Density	Optimum Moisture Content lb/ft ³	In Place Density pcf	In Place Moisture %
15	2-3½	ST	--	NP	--	SM	0.91	--	1×10^{-4}	--	--	--	--	89.9	17.2
15	2-4	BS	25	22	3	SM	0.98	--	8×10^{-4}	--	--	109.2	17.0	--	--
15	8-9 (T)	ST	55	33	22	MH	0.61	1×10^{-8}	--	--	--	--	--	--	--
15	8-9 (B)	ST	--	--	--	SP-SM	--	--	--	--	--	--	--	115.4	10.7
16	3½-4½	ST	48	37	11	ML	0.66	2×10^{-7}	--	2×10^{-7}	108.0	108.6	--	94.2	23.8
16	6-9	BS	34	26	8	SC	0.56	--	--	--	--	--	17.0	--	--
16	28-32	BS	--	--	--	SP-SM	--	--	--	--	--	--	--	--	14.1

-- Not determined



Landfill Site Selection Study No. 26-011-75/76, 27 May-10 Jun



DRILLING LOGS

US ARMY ENVIRONMENTAL HYGIENE AGENCY



DRILLING LOG

PROJECT 26-011-75/76 DATE 29 May 1975
 LOCATION Ft Bragg - Site 3 DRILLERS CPT Coonley, Messrs.
E2,012,920 N 500,360 Kestner & Barnes
 DRILL RIG Ranger I, 4" Auger BORE HOLE #1

Page 1 of 3 pages

FEET	SAMPLE TYPE		
DEPTH	BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Reddish, loose, medium to coarse sand w some clay	Drilling in bottom of old borrow pit, 15' below natural ground surface. NOT TESTED
	SS 6/8/16		
5		Tan, very loose, medium to coarse quartz sand	
	ST Driver		SP D - 69.9 lb/ft ³ M - 3.1%
10		Tan to brown, loose, medium to coarse quartz sand	
15			

US ARMY ENVIRONMENTAL HYGIENE AGENCY



DRILLING LOG

PROJECT 26-011-75/76 DATE 29 May 1975
 LOCATION Ft Bragg - Site 3 DRILLERS CPT Coonley, Messrs.
E2,012,920 N 500,360 Kestner & Barnes
 DRILL RIG Ranger I, 4" Auger BORE HOLE #1
 Page 2 of 3 pages

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
			Very moist
		White to pink, loose, coarse quartz sand.	
	ST Driven		Water
20			SP K _e - 1×10^{-3} cm/s e - 0.60 D - 99.8 lb/ft ³ M - 12.8%
		Tan, loose, medium to coarse quartz sand	
25			
30			



DRILLING LOG

DATE 29 May 1975

DRILLERS CPT Coonley, Messrs.

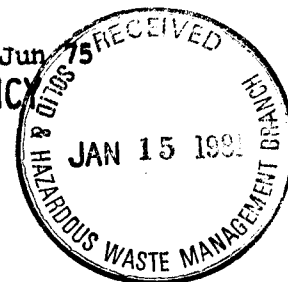
Kestner & Barnes

BORE HOLE #1

Page 3 of 3 pages

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US ARMY ENVIRONMENTAL HYGIENE AGENCY



DRILLING LOG

PROJECT 26-011-75/76 DATE 30 May 1975
 LOCATION Ft Bragg - Site 3 DRILLERS CPT Coonley, Messrs.
E2,012,200 N 500,080 Kestner & Barnes
 DRILL RIG Ranger I, 4" Auger BORE HOLE #2

Page 1 of 2 pages

FEET DEPTH	SAMPLE TYPE BLOWS PER 6 IN.	DESCRIPTION	REMARKS
5		Tan, loose, well graded sand	Drilling in bottom of old borrow pit, 12' below natural ground surface
		Red to purple, loose, well graded sand w mica flakes	
		Brown, loose, poorly graded sand w some clay	
		White, loose, uniform medium sand	
10		Reddish tan, loose, medium to coarse sand w some clay and small pebbles	
15			



PROJECT	<u>26-011-75/76</u>	DATE	<u>30 May 1975</u>
LOCATION	<u>Ft Bragg - Site 3</u>	DRILLERS	<u>CPT Coonley, Messrs.</u>
	<u>E2,012,200 N500,080</u>		<u>Kestner & Barnes</u>
DRILL RIG	<u>Ranger I, 4" Auger</u>	BORE HOLE	<u>#2</u>

DEPTH	FEET	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.			
			Reddish tan, loose, medium to coarse quartz sand	Wetter
20			Reddish tan, loose, medium to coarse sand w some clay	
22			Bottom of hole	

US ARMY ENVIRONMENTAL HYGIENE AGENCY



DRILLING LOG

PROJECT 26-011-75/76 DATE 2 June 1975
 LOCATION Ft Bragg - Site 2 DRILLERS CPT Coonley, Messrs.
E 1,984, 630 N 506, 800 Kestner & Barnes
 DRILL RIG Ranger I, 4" Auger BORE HOLE #3

Page 1 of 2 pages

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
5		Tan, loose, medium to fine sand	Slightly moist
	SS 4/12/14	Reddish tan, loose, fine to medium sand w some clay	No sample recovered
		Reddish tan, loose, fine to medium clayey sand	Water
10			
		Reddish tan, loose, coarse sand w some clay	
15			

Landfill Site Investigation
US ARMY ENVIRONMENTAL HYGIENE AGENCY



DRILLING LOG

PROJECT 26-011-75/76 DATE 2 June 1975
 LOCATION Ft Bragg - Site 2 DRILLERS CPT Coonley, Messrs.
E 1,984, 630 N 506, 800 Kestner & Barnes
 DRILL RIG Ranger I, 4" Auger BORE HOLE #3

Page 2 of 2 pages

FEET	SAMPLE TYPE	DESCRIPTION	REMARKS
DEPTH	BLOWS PER 6 IN		
18	ST Driven	Gray, very stiff, high plastic clay w some sand Bottom of hole	CL LL - 36 PL - 22 PI - 14 K - 1×10^{-8} cm/s e - 0.40 D - 124.8 lb/ft ³ M - 14.0%



DRILLING LOG

PROJECT 26-011-75/76DATE 2 June 1975LOCATION Ft Bragg - Site 2DRILLERS CPT Coonley, Messrs.E 1,985,520 N 507,670Kestner & BarnesDRILL RIG Ranger I, 4" AugerBORE HOLE # 4

Page 1 of 3 pages

FEET	SAMPLE TYPE	DESCRIPTION	REMARKS
DEPTH	BLOWS PER 6 IN		
5	BS	Light brown, loose, fine to medium sand	Slightly moist SP - SM LL - 18 PL - 20 PI
		Tan, loose, fine to medium sand w some clay	
		Reddish tan, dense, fine to medium clay	
		Reddish tan, loose, fine to medium sand	
10	ST Driven	Gray, loose, medium to coarse	Water SP K _e - 2 x 10 ⁻⁴ cm/s e - 0.68 D - 99.2 lb/ft ³ M - 18.0%
		Sand w some clay	
		Tan, loose, fine sand w some clay	
15			No return 10 to 16 ft. Log based on cuttings obtained when auger was pulled out of ground.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG



PROJECT 26-011-75/76 DATE 2 June 1975
LOCATION Ft Bragg - Site 2 DRILLERS CPT Coonley, Messrs.
El, 985,520 N507,670 Kestner & Barnes
DRILL RIG Ranger I, 4" Auger BORE HOLE #4
Page 2 of 3

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
20	ST Driven	Pink to gray, very stiff, high plastic clay w some coarse sand	ML LL - 27 PL - 26 PI - 1 K - 5×10^{-9} cm/s e - 0.54 D - 105.5 lb/ft ³ M - 18.0%
25			
30			

DRILLING LOG



DATE 2 June 1975

DRILLERS^{CPT} Coonley, Messrs.

Kestner & Barnes

BORE HOLE #4

Page 3 of 3 pages

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
35		Tan to yellow, loose clayey sand	
38		Bottom of hole	

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG



PROJECT 26-011-75/76

DATE 3 June 1975

LOCATION Ft Bragg - Site 2

DRILLERS CPT Coonley, Messrs.

E1,983,860 N506,100

Kestner & Barnes

DRILL RIG Ranger I, 4" Auger

BORE HOLE #5

Page 1 of 3 pages

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
		Brown, loose, medium sand	
		Light brown to tan, loose, medium sand	
5	BS	Tan, loose, fine to medium quartz sand	SP K _r - 4×10^{-6} e _r - 0.36 d _m - 124.2 lb/ft ³ d _r - 122.9 lb/ft ³ M ₀ - 10.5%
10		Brown to tan, loose, fine to medium sand w some clay	Not tested
		Reddish tan, loose, medium to coarse sand w some clay	
	ST Driven		
15		Tan, very loose, fine to medium sand w clay	

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG



PROJECT 26-011-75/76

DATE 3 June 1975

LOCATION Ft Bragg - Site 2
E1,983,860 N506,100

DRILLERS CPT Coonley, Messrs.
Kestner & Barnes

DRILL RIG Ranger I, 4" Auger

BORE HOLE #5

Page 2 of 3 pages

FEET DEPTH	SAMPLE TYPE BLOWS PER 6 IN	DESCRIPTION	REMARKS
20	BS	Tan, loose, medium to coarse sand w clay and gravel	SP - SM LL PL - NP PI $K_r - 2 \times 10^{-4} \text{ cm/s}$ $e - 0.39$ $d_m - 122.9 \text{ lb/ft}^3$ $d_r - 121/1 \text{ lb/ft}^3$ $m_o - 10.0\%$ Moist
25	ST Driven		Very wet Water
30			SP $K - 4 \times 10^{-3} \text{ cm/s}$ $e - 0.73$ $D - 106.0 \text{ lb/ft}^3$ $M - 20.0\%$

US ARMY ENVIRONMENTAL HYGIENE AGENCY



DRILLING LOG

PROJECT 26-011-75/76DATE 3 June 1975LOCATION Ft Bragg - Site 2DRILLERS CPT Coonley, Messrs.E1,983,860 N506,100Kestner & BarnesDRILL RIG Ranger I, 4" AugerBORE HOLE #5

Page 3 of 3 pages

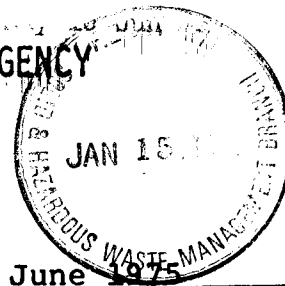
FEET DEPTH	SAMPLE TYPE BLOWS PER 6 IN	DESCRIPTION	REMARKS
35		Gray, stiff, medium to high plastic clay w some coarse sand	
		Bottom of hole	
38			

Land

Site Select

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 26-011-75/76DATE 3 June 1975LOCATION Ft Bragg - Site 2DRILLERS CPT Coonley, Messrs.E1,985,640 N506,620Kestner & BarnesDRILL RIG Ranger I, 4" AugerBORE HOLE #6

Page 1 of 3 pages

FEET DEPTH	SAMPLE TYPE BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Brown to tan, loose, fine to coarse quartz sand	
		Reddish tan, loose, fine to coarse quartz sand w some clay	Moist
5	ST Driven		SP - SC LL - 18 PL - 10 PI - 8 D - 116.1 lb/ft ³ M - 11.7%
10			
		Tan, dense, medium clayey quartz sand	Very moist SP - SM LL PL - NP PI
	ST Driven		Water
15			

US ARMY ENVIRONMENTAL HYGIENE AGENCY



DRILLING LOG

PROJECT 26-011-75/76DATE 3 June 1975LOCATION Ft Bragg - Site 2DRILLERS CPT Coonley, Messrs.E1,985,640 N506,620Kestner & BarnesDRILL RIG Ranger I, 4" AugerBORE HOLE #6

Page 2 of 3 pages

FEET	SAMPLE TYPE		
DEPTH	BLOWS PER 6 IN	DESCRIPTION	REMARKS
			K - 1×10^{-5} cm/s e - 0.55 D - 111.7 lb/ft ³ M - 12.9%
20		Tan to white, loose, fine to medium sand w some clay	
		Light tan, loose, fine to medium quartz sand w mica flakes	
25			
30			



PROJECT 26-011-75/76

DATE 3 June 1975

LOCATION Ft Bragg - Site 2

DRILLERS^{CPT} Coonley, Messrs.

El,985,640 N506,620

Kestner & Barnes

DRILL RIG Ranger I, 4" Auger

BORE HOLE #6

Page 3 of 3 pages

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
35			
38		Gray and purple, very stiff high plastic clay - little or no sand Bottom of hole	Harder drilling

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

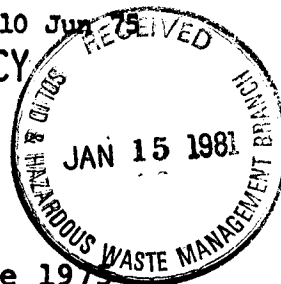
PROJECT 26-011-75/76DATE 4 June 1975LOCATION Ft Bragg - Site 1DRILLERS SPT Coonley, Messrs.E2,006,700 N503,340Kestner & BarnesDRILL RIG Ranger I, 4" AugerBORE HOLE #6

Page 1 of 2 pages

FEET	SAMPLE TYPE		
DEPTH	BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Brown, loose, fine to medium sand	SP D - 99.2 lb/ft ³ M - 8.8%
		Tan, loose, fine to coarse sand w gravel	
	SS 4/9/10		
		Tan, loose, fine to coarse sand (no gravel)	
5			
		Tan, loose, fine to medium quartz sand	
		Dark tan, dense, fine to medium sand w clay	
10	SS 2/8/9		Only 16" of sample recovered SW - SM LL - 22 PL - 20 PI - 2 M - 11.2% Water
	ST Driven		SW - SM K _e - 6 x 10 ⁻³ cm/s e _e - 0.57

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 26-011-75/76DATE 4 June 1975LOCATION Ft Bragg - Site 1DRILLERS CPT Coonley, Messrs.E2,006,700 N503,340Kestner & BarnesDRILL RIG Ranger I, 4" AugerBORE HOLE #7

Page 2 of 2 pages

FEET DEPTH	SAMPLE TYPE BLOWS PER 6 IN	DESCRIPTION	REMARKS
20		Tan to purple, fine to medium, clayey sand	D - 114.8 lb/ft ³ M - 9.0%
22		Bottom of hole	



DRILLING LOG

PROJECT 26-011-75/76
 LOCATION Ft Bragg - Site 2
El. 983,680 N507,180
 DRILL RIG Ranger I, 4" Auger

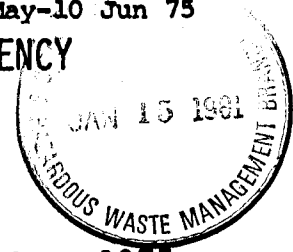
DATE 4 June 1975
 DRILLERS CPT Coonley, Messrs.
Kestner & Barnes
 BORE HOLE #8

Page 1 of 4 pages

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
5		Light brown to tan, loose, fine to medium quartz sand	
		Sandstone stringer, tan, loose, fine quartz sand w some coarse sand	
		Tan, loose, fine to medium sand w clay	
		White & purple, stiff, medium to high plastic clay w some sand	
10	ST Driven	Tan to white, loose, fine sand w some clay	SM LL PL - NP PI $K_e - 1 \times 10^{-4} \text{ cm/s}$ $e - 0.49$ $D - 108.0 \text{ lb/ft}^3$ $M - 9.7\%$
15		Reddish gray, loose, fine to medium quartz sand	
		Tan, loose, fine quartz sand	

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 26-011-75/76DATE 4 June 1975LOCATION Ft Bragg - Site 2DRILLERS CPT Coonley, Messrs.E1,983,680 N507,180Kestner & BarnesDRILL RIG Ranger I, 4" AugerBORE HOLE #8

Page 2 of 4 pages

FEET DEPTH	SAMPLE TYPE BLOWS PER 6 IN	DESCRIPTION	REMARKS
20			Moist
		Tan, loose, medium to coarse quartz sand	
25			Very moist
30			

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 26-011-75/76DATE 4 June 1975LOCATION Ft Bragg - Site 2DRILLERS CPT Coonley, Messrs.E1,983,680 N507,180Kestner & BarnesDRILL RIG Ranger I, 4" AugerBORE HOLE #8
page 3 of 4 pages

DEPTH	SAMPLE TYPE BLOWS PER 6 IN.	DESCRIPTION	REMARKS
35		Tan, loose, medium to coarse quartz sand w some clay	Very moist
40			
45		Light, tan, loose, fine to medium sand w some clay	Moist

15 1981
1978

DATE 4 June 1975

DRILLERS CPT Coonley, Messrs.

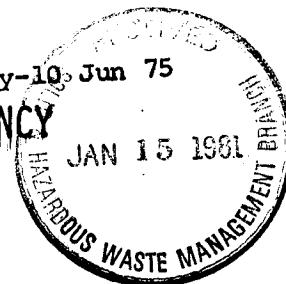
Kestner & Barnes

BORE HOLE #8

Page 4 of 4 pages

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
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50		Bottom of hole	Water

US ARMY ENVIRONMENTAL HYGIENE AGENCY



DRILLING LOG

PROJECT 26-011-75/76 DATE 5 June 1975
 LOCATION Ft Bragg - Site 2 DRILLERS CPT Coonley, Messrs.
E1,984,600 N508,030 Kestner & Barnes
 DRILL RIG Ranger I, 4" Auger BORE HOLE #9

Page 1 of 2 pages

FEET DEPTH	SAMPLE TYPE BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Brown, very dense, fine to medium quartz sand	
		Tan, dense, fine to medium quartz sand w some clay	
5	SS 9/18/32	Reddish tan, dense, fine to medium clayey sand	CL LL - 26 PL - 16 PI - 10 K - 2×10^{-6} cm/s e - 0.54 D - 91.7 lb/ft ³ M - 15.6%
10		Tan and brown, loose, fine to medium sand w some clay	
15			Water



DRILLING LOG

PROJECT 26-011-75/76
 LOCATION Ft Bragg - Site 2
E1,985,320 N508,670
 DRILL RIG Ranger I, 4" Auger

DATE 5 June 1975
 DRILLERS CPT Coonley, Messrs.
Kestner & Barnes
 BORE HOLE #10
 Page 1 of 2 pages

FEET	SAMPLE TYPE		
DEPTH	BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Brown, loose, fine to medium quartz sand	
		Tan, loose, fine to medium sand	
		Tan to yellow, loose, fine quartz sand	
5			
	BS	Reddish, loose, fine sand or coarse silt	SP - SM LL - 18 PL - 20 PI K - 5×10^{-5} cm/s e^e - 0.53 d_m - 116.7 lb/ft ³ m_o - 13.7% Water
10	SS* 7/11/12		
	BS	Reddish brown, soft, low plastic sandy clay	*3" of SS sample re-covered, then discarded. SM LL - 18 PL - 16 PI - 2 SS - not sampled
15	SS		

DRILLING LOG



PROJECT 26-011-75/76

DATE 5 June 1975

LOCATION Ft Bragg - Site 2

DRILLERS CPT Coonley, Messrs.

E1,985,320 N508,670

Kestner & Barnes

DRILL RIG Ranger I, 4" Auger

BORE HOLE #10

Page 2 of 2

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
	1/3/10	Reddish, loose, medium clayey quartz sand	
20			
25		White tan, fine clayey sand Bottom of hole	

US ARMY ENVIRONMENTAL HYGIENE AGENCY



DRILLING LOG

PROJECT 26-011-75/76DATE 5 June 1975LOCATION Ft Bragg - Site 2DRILLERS CPT Coonley, Messrs.E1,983,730 N508,600Kestner & BarnesDRILL RIG Ranger I, 4" AugerBORE HOLE #11

Page 1 of 3 pages

FEET	SAMPLE TYPE	DESCRIPTION	REMARKS
DEPTH	BLOWS PER 6 IN		
		Tan, loose, fine to medium quartz sand	
		Reddish brown to tan, loose, fine to medium sand w some clay	
5	ST Driven		SP - SC LL - 28 PL - 17 PI - 11 D - 118.6 lb/ft ³ M - 13.9%
		Reddish, loose, fine to medium sand w some clay	
10			
		Tan and brown, loose, fine sand or coarse silt	
15			

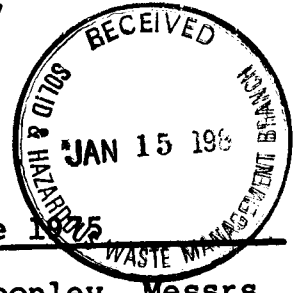
US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 26-011-75/76DATE 5 June 1975LOCATION Ft Bragg - Site 2DRILLERS CPT Coonley, Messrs.E1,983,730 N508,600Kestner & BarnesDRILL RIG Ranger I, 4" AugerBORE HOLE #11

Page 2 of 3 pages

FEET DEPTH	SAMPLE TYPE BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Reddish tan, loose, fine quartz sand	
			Moist
20		Tan, loose, fine to coarse sand w some clay	
			Water
25			
30			



DRILLING LOG

PROJECT 26-011-75/76

DATE 5 June 1975

LOCATION Ft Bragg - Site 2
E1,983,730 N508,600

DRILLERS CPT Coonley, Messrs.

Kestner & Barnes

DRILL RIG Ranger I, 4" Auger

BORE HOLE #11

Page 3 of 3 pages

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US ARMY ENVIRONMENTAL HYGIENE AGENCY



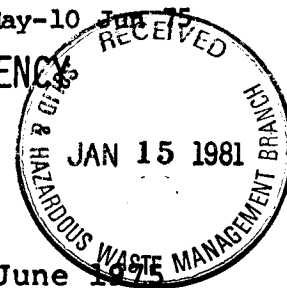
DRILLING LOG

PROJECT 26-011-75/76DATE 6 June 1975LOCATION Ft Bragg - Site 1DRILLERS CPT Coonley, MessrsE2,005,550 N503,990Kestner & BarnesDRILL RIG Ranger I, 4" AugerBORE HOLE #12

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
5	ST Driven	Tan, brown & gray, medium sand, cohesive w some clay	SS 4/9/9, no sample recovered, 1½ to 3 ft Water
		Reddish brown, dense, fine to medium clayey sand	
		Clear, loose, coarse quartz sand	
		Tan, loose, fine to medium sand	
10	ST Driven	Gray, stiff, high plastic clay w some sand (dry)	SM LL - 27 PL - 24 PI - 3 K - 3 x 10 ⁻⁷ cm/s e - 0.85 D - 114.2 lb/ft ³ M - 36.5%
14	ST Driven	Bottom of hole	SW - SC LL - 30 PL - 18 PI - 12 K - 1 x 10 ⁻⁴ cm/s e - 0.54 D - 110.4 lb/ft ³ M - 13.2%

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 26-011-75/76DATE 6 June 1975LOCATION Ft Bragg - Site 1
E2,005,880 N504,200DRILLERS CPT Coonley, Messrs.
Kestner & BarnesDRILL RIG Ranger I, 4" AugerBORE HOLE #13

Page 1 of 3 pages

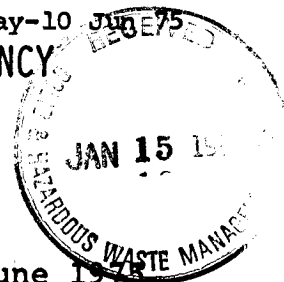
FEET	SAMPLE TYPE		
DEPTH	BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Brown, loose, fine sand	
		Mottled, tan, white & reddish very dense, medium to coarse sand	
	ST Driven		
5		Dark tan, loose, medium sand	
		Light tan, loose to dense, medium to fine quartz sand	
		Dark tan, loose, fine sand	
		Gray and light tan, loose, very fine sand w some mica flakes	
		Rust colored loose, fine sand w mica flakes	
10		Rust colored, loose, coarse gravel w sand matrix	
		Rust colored, loose, fine gravel and coarse sand	
		Dark tan and white, medium to coarse quartz sand w some clay	
15			

SM
LL - 15
PL - 12
PI - 3
K - 2×10^{-4} cm/s
e - 0.67
D - 104.2 lb/ft³
M - 4.0

Moist

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 26-011-75/76DATE 6 June 1975LOCATION Ft Bragg - Site 1DRILLERS CPT Coonley, Messrs.E2,005,880 N504,200Kestner & BarnesDRILL RIG Ranger I, 4" AugerBORE HOLE #13

Page 2 of 3 pages

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
			Water
20			
25			
30			

15 1981

DATE 6 June 1975

DRILLERS^{CPT} Coonley, Messrs.
Kestner & Barnes

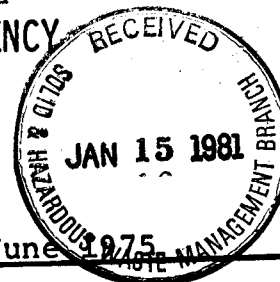
BORE HOLE #13

Page 3 of 3 pages

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US ARMY ENVIRONMENTAL HYGIENE AGENCY

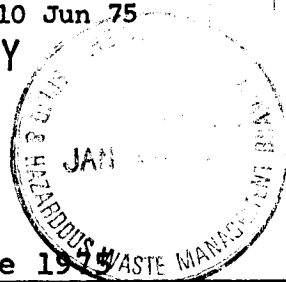
DRILLING LOG

PROJECT 26-011-75/76DATE 6 June 1975LOCATION Ft Bragg - Site 1DRILLERS CPT Coonley, Messrs.E2,006,400 N504,160Kestner & BarnesDRILL RIG Ranger I, 4" AugerBORE HOLE #14

Page 1 of 2 pages

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
5		Gray, loose, fine quartz sand	Very moist
		Tan, loose, medium sand w some clay	
10	ST Driven	Light gray, soft, medium plastic clay w sand	3" ST sample tried 6 to 7.5 ft. No sample recovered
		Tan, loose, medium sand w some very stiff yellow-brown clay	
15			ST, 7.5 to 9.0 ft, Top ML LL - 41 PL - 26 PI - 15 K - 6×10^{-8} cm/s e - 0.71 D - 104.8 lb/ft ³ M - 21.3% Water
			ST, 7.5 to 9.0 Ft, Bottom SM LL - 17 PL - 15 PI - 2 D - 112.3 lb/ft ³ M - 15.0%

DRILLING LOG



PROJECT 26-011-75/76

DATE 6 June 1975

LOCATION Ft Bragg - Site 1

DRILLERS CPT Coonley, Messrs.

E2,006,400 N504,160

Kestner & Barnes

DRILL RIG Ranger I, 4" Auger

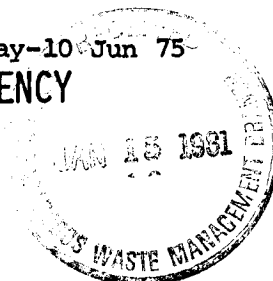
BORE HOLE #14

Page 2 of 2 pages

FEET DEPTH	SAMPLE TYPE BLOWS PER 6 IN	DESCRIPTION	REMARKS
18		Mottled, gray, red and tan, very stiff, low plastic sandy clay	
		Bottom of hole	
	ST Driven		SM PL - NP PI K _e 3 x 10 ⁻⁴ cm/s e - 0.53 D - 91.7 lb/ft ³ M - 20.4%

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 26-011-75/76DATE 7 June 1975LOCATION Ft Bragg - Site 4DRILLERS CPT Coonley, Messrs.E1,986,800 N499,580Kestner & BarnesDRILL RIG Ranger I, 4" AugerBORE HOLE #15

Page 1 of 2 pages

FEET	SAMPLE TYPE	DESCRIPTION	REMARKS
DEPTH	BLOWS PER 6 IN		
5	ST Driven 2-3½ FT BS 2-4 FT	Reddish, loose, fine quartz sand	ST, 2-3.5 ft SM
		Reddish brown, medium soft, fine to medium quartz sand w some clay	LL PL - NP PI $K_e - 1 \times 10^{-4}$ cm/s $e - 0.91$ $D - 89.9$ lb/ft ³ $M - 17.2\%$
		Brown, dense, medium to fine sand	BS 2-4 Ft SM
		Water	LL - 25 PL - 22 PI - 3 $K_e - 8 \times 10^{-4}$ cm/s $e - 0.98$
10	ST Driven	Tan, loose, coarse quartz sand w some clay	
		Gray, stiff, medium to high plastic clay	Dry ST, 8-9 Ft, Top MH
		Dark red and light tan, dense, coarse sand w sandstone	LL - 55 PL - 33 PI - 22 $K - 1 \times 10^{-8}$ cm/s $e - 0.61$
		Tan, loose, coarse quartz sand	Hard drilling ST, 8-9 Ft, Bottom SP - SM $D - 115.4$ lb/ft ³ $M - 10.7\%$
15			Soft drilling

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 26-011-75/76
 LOCATION Ft Bragg - Site 4
E1,986,800 N499,580
 DRILL RIG Ranger I, 4" Auger

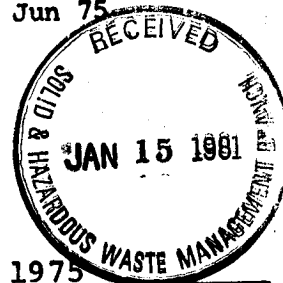
DATE 7 June 1975
 DRILLERS CPT Coonley, Messrs.
Kestner & Barnes
 BORE HOLE #15

Page 2 of 2 pages

FEET DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
20		Gray & tan, stiff, low to medium plastic sandy clay	Harder drilling, dry
		Tan, loose, coarse quartz sand	Softer drilling
22		Bottom of hole	
			NOTES: 1. Pit is probably in Tuscaloosa Formation as evidenced by much cross-bedded sand and clay. 2. The water at 6 ft is apparently perched. Water was coming in the side of the hole and falling to the bottom producing a "gurgling" sound. The hole never filled with water.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

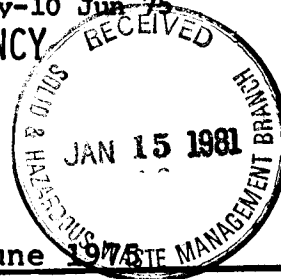
PROJECT 26-011-75/76DATE 7 June 1975LOCATION Ft Bragg - Site 4DRILLERS CPT Coonley, Messrs.El, 987,760 N499,600Kestner & BarnesDRILL RIG Ranger I, 4" AugerBORE HOLE #16

Page 1 of 4 pages

FEET DEPTH	SAMPLE TYPE BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Reddish, loose, fine to medium sand w some clay	
		Brown, loose, medium to fine clayey sand	ML LL - 48 PL - 37 PI - 11
5	ST Driven	Mottled gray, stiff, medium to high plastic sandy clay	K - 2×10^{-7} cm/s e - 0.66 D - 94.2 lb/ft ³ M - 23.8%
	BS	Tan, loose, fine clayey sand	SC LL - 34 PL - 26 PI - 8 K _r - 2×10^{-7} cm/s e _r - 0.56 d _m - 108.6 lb/ft ³ d _r - 108.0 lb/ft ³ m ₀ - 17.0%
10	ST Driver		Not tested Moist
15			

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 26-011-75/76DATE 7 June 1976LOCATION Ft Bragg - Site 4DRILLERS CPT Coonley, Messrs.E1,987,760 N499,600Kestner & BarnesDRILL RIG Ranger I, 4" AugerBORE HOLE #16

Page 2 of 4 pages

FEET DEPTH	SAMPLE TYPE BLOWS PER 6 IN.	DESCRIPTION	REMARKS
20		Light gray, loose, fine sand w some clay	Moist
		Light gray, loose, fine clayey sand	
25		Yellow and tan, loose, fine to medium sand w clay	Moist
30	BS	Yellow and tan, loose, medium to coarse clayey sand	SP - SM M - 14.1%

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 26-011-75/76DATE 7 June 1975LOCATION Ft Bragg - Site 4DRILLERS CPT Coonley, Messrs.El, 987,760 N499,600Kestner & BarnesDRILL RIG Ranger I, 4" AugerBORE HOLE #16

Page 3 of 4 pages

FEET	SAMPLE TYPE		
DEPTH	BLOWS PER 6 IN.	DESCRIPTION	REMARKS
			Slightly harder drilling 30 to 31 ft
			Very soft drilling Water
35		Tan, loose, coarse quartz sand w some clay	
40		Tan and white, loose, fine to medium quartz sand	
45		Light tan, loose, medium quartz sand	

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 26-011-75/76

DATE 7 June 1975

LOCATION Ft Bragg - Site 4
E1,987,760 N499,600

DRILLERS CPT Coonley, Messrs.
Kestner & Barnes

DRILL RIG Ranger I, 4" Auger

BORE HOLE #16
Page 4 of 4 pages

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APPENDIX D

SITES INVESTIGATED

1. Site 1 comprises approximately 30 acres, west of Knox Street and south of the Honeycutt Marshalling Area. The site is heavily wooded and occupies the V formed by Beaver Creek and a tributary bordering the most recently completed landfill. The land slopes gently toward the southwest and toward the east. Four bore holes, 14 to 34 ft deep, indicated a soil profile of loose, poorly graded sand-silt mixtures. Clay layers greater than 6 inches thick were rare. With one exception, all clay layers were below the water table. The sands overlying the clays are very permeable and offer little resistance to water movement. Ground-water levels stabilized at depths of 2 to 15 ft below the ground surface. The close proximity of two surface streams and the shallow ground-water table combined with high soil permeability indicate Site 1 would require major improvement in order to protect the adjacent water resources. Therefore, Site 1 should not be used for sanitary landfilling unless the permeability of soils under the landfill can be reduced to 10 ft/yr or less, a 5-ft minimum separation is provided between the seasonal high water table and the bottom of any excavation, and especially close attention is paid to actual operation to prevent surface water pollution. In addition, a leachate collection system may be required by a site designer if future economic conditions ever warrant making the necessary improvements to use Site 1 for a sanitary landfill. Site 1 is the second alternate to Site 2.

2. Site 2 is discussed in paragraph 5c, main body of this report.

3. Site 3 comprises approximately 30 acres with a possibility of expansion to 100 acres or more. The site is located 0.6 miles south, southwest of the junction of Gruber Road and Second Street, and 0.2 miles east of Bragg Blvd. The site is an old borrow pit which has been excavated 15 to 20 ft below the original ground surface. The pit is unvegetated and most of the surrounding area is covered with scrub brush. Two bore holes, 21 and 33 ft deep, indicate a soil profile of loose, poorly graded, medium-to-coarse quartz sand with some gravel and very little clay. Impermeable clay was not found in either bore hole. Water was found 17 to 18 ft deep in both bore holes. A 2-hour rain storm during drilling provided a visual example of the high permeability of this soil. Infiltration rates were greater than 1 ft per hour. Because of high soil permeability, lack of clay and relative closeness to the water table, extensive site improvements would be required for proper use as a landfill site. This situation combined with distance of the site from major waste sources, resulted in eliminating this site from consideration.

4. Site 4 comprises approximately 20 acres with a possibility of expansion to 50 acres or more. The site is located 1.2 miles west of the junction of



Landfill Site Selection Study No. 26-011-75/76, 27 May-10 Jun

Gruber and Yadkin Roads behind the 82nd Airborne Division area. The site is a borrow pit which has been used for troop training in the past. An adjacent, flat, partially cleared chemical, biological and radiological demonstration area could also be used for a sanitary landfill. The unvegetated pit has been excavated 5 to 20 ft below the original ground surface. All drainage from the eastward sloping pit flows into a central channel and then out the pit's eastern end. Two bore holes, 22 and 50 ft deep, indicated a general soil profile of loose, poorly graded sands with silt and clay intermixed. Clay layers greater than 6 inches thick were found several times, particularly in Bore Hole 15. Water was found at 6 and 35 ft. However, the water at 6 ft is from a perched water table. Water flowed from the side of the bore hole and drained through the bottom of the bore hole for at least 1 month after drilling. The general soil conditions at Site 4 are similar to Site 2. The site is amenable to the area method of landfilling provided surface drainage now entering the pit is diverted around the pit. If perched water tables are lowered by the use of bore holes penetrating the supporting impermeable beds, then additional excavation of the pit would be possible to provide cover material for the landfill operation. Another source of cover material is the adjacent chemical biological and radiological demonstration area. Site 4 is the first alternate to Site 2.



APPENDIX E

WATER QUALITY MONITORING

1. SUBSURFACE MONITORING. Due to the underlying hydrogeology, monitoring of ground-water quality is a difficult task. Since this investigation has already shown the existence of several perched water bodies below the site, there is a question of which water bodies should be sampled. If a decision is made to sample perched water tables, then a major subsurface investigation must be made to define each of the perched water bodies. In addition, if it is desirable to monitor the uppermost aquitard (leaky aquifer) or confined aquifer, then installation of one or more observation wells, perhaps over 100 ft deep, would be required. As discussed in paragraph 5c(3), water movement will be primarily in a lateral direction. Therefore, monitoring of perched water, aquitards, or confined aquifers is not as likely to detect leachate contamination as is monitoring of surface streams receiving discharges from perched ground water.

2. SURFACE MONITORING. Surface water monitoring is important because McPherson Creek flows into the Little River above the intake point for Ft Bragg's primary water supply (see Figure 1). To detect changes in surface water quality which indicate a need for additional protection of the water supply, at least one surface water monitoring point should be established. Since all streams surrounding Site 2 discharge into McKellar's Pond, it is suggested the effluent from the pond (C on Figure 1) be monitored annually for the parameters listed in Table E-1. In addition, monitoring by use of field methods should be performed quarterly to provide an earlier indication of surface water contamination by leachate. The tests indicated in Table E-2 should be performed quarterly on samples collected from McPherson Creek, about 0.6 miles east of Site 2 at the tank trail crossing (A on Figure 1), and collected from the unnamed tributary entering the western arm of McKellar's Pond about 0.3 miles upstream from McKellar's Pond (B on Figure 1). Analytical support for annual monitoring may require the use of a civilian contractor. The analytical support for quarterly monitoring should exist or be developed at Ft Bragg.

Landfill Site Selection Study No. 26-011-75/76, 27 May-10 Jun 75

TABLE E-1. SUGGESTED WATER QUALITY PARAMETERS TO BE MONITORED ANNUALLY¹

PARAMETERS		
Inorganic	Organic	Other
Arsenic	Chlorinated hydrocarbons:	Turbidity
Barium	Endrin	Coliform Bacteria
Cadmium	Lindane	
Chromium	Methoxychlor	
Fluoride	Toxaphene	
Lead	Chlorophenoxys:	
Mercury	2,4-D	
Selenium	2,4,5-TP Silvex	
Silver		
Sodium		
Sulfate		

¹ Adapted from National Interim Primary Drinking Water Regulation, 40 Federal Register 59566, 24 December 1975

TABLE E-2. SUGGESTED WATER QUALITY PARAMETERS TO BE MONITORED QUARTERLY

PARAMETERS	
Acidity	Orthophosphate (as P)
Alkalinity	pH
Nitrate (as N)	Total Dissolved Solids

.0112 SANITARY LANDFILL OPERATIONAL PLANS:

1. Plans and data required for operational approval include:

- a. Plot Plan, Sanitary Landfill, Dwg No. DFE-02.
- b. Contour Map, Dwg No. DFE-03.
- c. Trench Profiles and Cross Sections, Dwg Nos. PE-04, PE-05, and PE-06.

2. The method of landfiling currently used is the trenching method. Trenches are excavated with bulldozer, dragline, and scraper. Backfilling and covering of cells is accomplished daily with landfill compactor.

3. The outer slopes of the completed portion of the landfill are protected from soil erosion by constructing berms along the upper edge of slope and installing 30 inch diameter CMP to discharge surface runoff to a protected outlet at the toe of the slope. Terraces have been and will continue to be constructed across the completed portion of the landfill for purpose of channeling surface runoff to the piped outlets.

4. The completed portion of the landfill including the outer slopes will be seeded with a mixture of native grasses. Preparation for seeding includes fertilizer and lime as necessary to support the vegetation.

5. A buffer zone of natural woodland, no less than 200 feet in width, will be maintained between the edges of the landfill and any natural watercourse. Any siltation from the landfill will be confined within the buffer zone.

6. As recommended by US Army Environmental Hygiene Agency, the effluent of McKellars Pond, McPherson Creek, and an unnamed tributary to McKellars Pond are being monitored. Water samples are collected from these locations once every three months and are analyzed to determine water quality. Parameters being monitored are pH, chloride, sulfate, and total dissolved solids. This work is performed by contract with commercial laboratory.



SECTION IV

CONTENTS

Statement in response to Section .0113 of Solid
Waste Management Rules.



.0113 RECORDATION

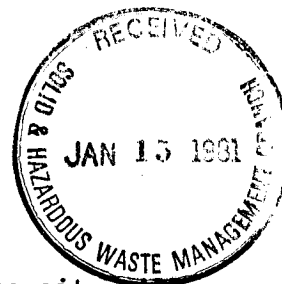
Because the landfill site is situated totally on US Army Installation, a complete description of the site, suitable for an instrument of conveyance, has not been accomplished. The plot plans and maps submitted in support of other sections of this submission are considered to be appropriate for locations. If it becomes necessary to have an accurate survey at a future date, such a survey could be accomplished from the available data.



SECTION V

CONTENTS

Data as specified in Section .0114 of Solid Waste
Management Rules.



.0114 REPORT

1. Population and area to be served by selected site: The site will serve all of Fort Bragg and Pope Air Force Base with combined military population of approximately 50,000.
2. Solid waste to be deposited in landfill includes domestic refuse from approximately 5,000 family housing units, troop mess hall food wastes, and normal waste generated by troop operations such as waste paper, wood crates, appliances, engine and motor parts, animal carcasses from veterinary clinic, and other wastes normally associated with commercial and industrial facilities.
3. Equipment normally used at site includes one bulldozer, one dragline, one 12 cubic yard self-propelled scraper, and one landfill compactor. Additional equipment of similar construction may be used in trench excavation.
4. The operation of the sanitary landfill is the responsibility of the Directorate of Facilities Engineering, Buildings and Grounds Division, Roads and Railroads Maintenance Branch. Individuals occupying the positions of Division and Branch Chiefs are tasked with operational responsibility.
5. Current projected use of the landfill after it is completed is to remain as rural forested land.
6. The current landfill is expected to last from 40-60 years depending upon the intensity of use.

Cumberland
Jwv/c

August 24, 1981

Mr. Bruce Parker
Facilities Engineering
Department of the Army
HQ XVIII Airborne Corps & Ft. Bragg
Ft. Bragg, NC 28307

Dear Bruce:

This is to confirm the results of our visit to the Ft. Bragg solid waste disposal facility on August 11, 1981. Andrew Robinson and I checked the three ground-water monitoring wells on site and found two of the three wells to be too dry to obtain a sample. In the third well the wooden plug had expanded due to moisture and could not be removed. We suggest all three wells be equipped with standard PVC caps to remedy this.

We will notify you when we plan to resample the wells. It will most probably be in the spring of next year.

Sincerely,

Gary D. Babb, Geologist
Solid & Hazardous Waste Management Branch
Environmental Health Section

GPB:ns